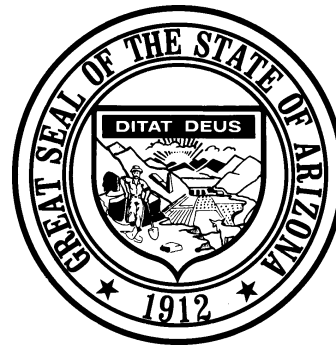


GUIDELINES FOR THE MANAGEMENT OF PATIENTS WITH ANTIBIOTIC-RESISTANT ORGANISMS

July 1999

Arizona Department
of Health Services
Bureau of Epidemiology
and Disease Control Services





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SUGGESTIONS FOR USING THIS MANUAL

This manual was developed to provide a practical guide for infection control and public health personnel when managing patients, residents, and clients with multiply resistant microorganisms.

Although every effort has been made to develop specific guidelines for a variety of health care settings, *e.g.*, acute care centers and outpatient dialysis units, the manual may not apply to all real life situations. There will be exceptions and extenuating circumstances when the recommendations in this manual will have to be applied after weighing all the available options.

The manual was organized to allow the user to read discrete sections without having to read the entire manual. However, we strongly encourage you to read background sections I through VII to obtain a working knowledge of the problem of antibiotic resistance and current thinking on prevention and control issues. Section VIII contains seven distinct subsections which address specific infection control recommendations in seven different health care settings (*e.g.*, long term care setting, ambulatory care settings). Although there are overlap and repetition of some language between these seven subsections, each is self contained and specifically written for application in that setting.

Various appendices are attached. These include question and answer fact sheets which address either MRSA or VRE for a variety of target audiences, including patients.

It should be noted that this manual does not contain guidelines for management of staff with multiply resistant microorganisms; current CDC and OSHA guidelines are designed to address this issue. We hope that you will find this publication useful and we welcome your comments and suggestions.

DISCLAIMER

The guidelines in this manual do not represent an official position of the Arizona Department of Health Services, but rather the consensus of the working group (listed on page 93) as a reasonable approach to managing patients with multiply resistant organisms in a variety of health care settings.

These guidelines are just that . . . guidelines. The Department does not claim authority for implementing or enforcing these guidelines. Whenever licensing or certification or accreditation requirements for a given health care facility regarding care and treatment of patients differ from the guidelines recommended in this manual, the specific facility's requirements should be followed.

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1. GLOSSARY OF TERMS

The following definitions apply to terms in this document.

assisted living facility - a residential care institution, including adult foster care, that provides or contracts to provide supervisory care services, personal care services, or directed care services on a continuing basis.

carrier - an individual who is colonized with an organism without clinical manifestations of disease.

cohort - two or more patients (infected or colonized with the same antibiotic-resistant organism) in a facility who are physically separated from other patients and cared for, as much as possible, by staff who do not provide for other patients.

colonized - the condition of a patient or health care worker in which an organism is present on a body site and is multiplying, but in which no symptoms or clinical manifestations of illness or infection are evident. A carrier may be colonized with MRSA or VRE. **A colonized person is a reservoir for the infectious agent and can transmit the organism to others.**

decolonized - the condition of a patient or health care worker after a previous colonization by an organism has been eliminated, either through the use of antiseptics or antibiotics used topically or by use of special systematic antibiotic regimens.

endemic - the usual or expected rate of colonization or infection with an organism within a facility; the endemic rate in each facility is unique to that facility.

epidemic - two or more epidemiologically linked cases of nosocomially-acquired infection in a facility **or** a significant increase in cases above the endemic rate at that facility as determined by infection control staff at that facility.

eradication - the complete elimination of an organism (colonization or infection) from patients and staff in a facility; although eradication is difficult to achieve, it may be attempted through implementation of infection control and hygiene measures or use of decolonization regimens. (*i.e.*, topical agents or antibiotic regimens).

fomite - an inanimate object that can transmit infection because it is contaminated by pathogenic organisms, such as MRSA or VRE; examples include stethoscopes, blood pressure cuffs, handkerchiefs, drinking glasses, telephones, bed linens, clothing, and toys.

immunocompromised - having a severe underlying medical condition which impairs a person's immune response to infectious agents.

incidence - the number of new infections, colonizations, or of persons falling ill, during a given period in a specific population.

infection - the invasion and multiplication of a bacteria in a body site associated with clinical signs or symptoms of infection (*i.e.*, fever, lesions, drainage from a wound) or increased white blood cell count. Distinguishing between colonization and infection is a clinical decision.

invasive disease - clinical manifestations of infection by an organism, either by natural or artificial means, that occurs when skin or the mucous membrane is compromised.

in vitro - in an artificial environment, *i.e.*, in a test tube.

in vivo - in a living organism, *i.e.*, in a living body.

LTCF (long term care facility) - for the purposes of this document, a facility providing rehabilitative or long term care to disabled, chronically ill, or elderly populations.

methicillin - one of a class of antibiotics (the semisynthetic penicillins – also includes nafcillin and oxacillin) effective in the treatment of penicillin-resistant bacteria such as *S. aureus*.

mode of transmission - the method by which microorganisms are spread to other individuals or into the environment.

MRSA (methicillin-resistant *Staphylococcus aureus*)- *S. aureus* resistant to methicillin and other semisynthetic antibiotics (e.g., nafcillin and oxacillin) that are effective against most strains of *S. aureus*.

multiply resistant organism - bacteria which demonstrate resistance to more than one antibiotic when tested *in vitro* against a panel of antibiotics. Resistance may be chromosomally or extra-chromosomally (plasmid) mediated.

nosocomial - an infection acquired in a hospital, long term care facility or other health or residential care facility.

outbreak - same as epidemic

resistance - the capacity, which can be mediated by a variety of mechanisms, for a bacteria to be able to grow in the presence of a given antibiotic. Resistance may be quantitatively expressed through use of disk diffusion, agar dilution (MIC) or automated methods.

S. aureus* - *Staphylococcus aureus- a Gram positive common skin bacteria which may become pathogenic and resistant to treatment.

surveillance - the monitoring of patient data to determine the baseline (endemic) rate of infection and to detect occurrences of new infections (incidence) in a facility.

susceptibility testing - an *in vitro* test performed in the laboratory to determine if an organism can be effectively treated with a particular antibiotic.

transmission - the transfer of microorganisms from a colonized or infected person to a person previously free of these microorganisms.

VISA (vancomycin intermediate resistant *Staphylococcus aureus*) - an isolate of *Staphylococcus*

aureus which is resistant to 8-16 $\mu\text{g/ml}$ when tested *in vitro* against vancomycin.

VRE (vancomycin resistant enterococcus) - an isolate of *Enterococcus faecium* or *Enterococcus faecalis* which is resistant to $\geq 32 \mu\text{g/ml}$ or demonstrates a zone size of $\leq 14 \text{ mm}$ when tested *in vitro* against vancomycin.

VRSA (vancomycin resistant *Staphylococcus aureus*)- an isolate of *Staphylococcus aureus* which is resistant to $\geq 32 \mu\text{g/ml}$ when tested *in vitro* against vancomycin.

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2. PURPOSE OF THIS MANUAL

Widespread use of antimicrobials in both the inpatient and outpatient setting has been associated with the emergence of drug resistant microorganisms. Bacterial strains that have been susceptible to all antimicrobial agents for decades have now developed resistance not only to those classic therapies but to newer agents as well.¹ Some organisms have developed resistance to recently developed antimicrobials almost as soon as the drugs were marketed.² Organisms that are resistant to several different groups of antimicrobials have become more prevalent in recent years.³ Multiply drug resistant strains of both hospital and community acquired organisms have become so widespread that selection of empiric antibiotic therapy for patients with serious infections has become as challenging as during the pre-antibiotic era.^{4,5}

Antibiotic resistance has been a concern in the medical community since the 1950's when the medical community became aware of and began responding to an increase in colonization and infection rates of methicillin-resistant *Staphylococcus aureus* (MRSA) in hospitalized patients. In 1991, the Infectious Disease Epidemiology Section, Arizona Department of Health Services (ADHS), disseminated the "Recommendations for the Transfer of Patients Colonized with Antibiotic Resistant Bacteria between Facilities and the Control of Methicillin-Resistant *Staphylococcus aureus* in Acute and Extended-Care Facilities."

Recently, a rapid increase in the occurrence of vancomycin-resistant enterococci (VRE) reported in U.S. hospitals has generated concern comparable to that observed when the MRSA problem was first recognized. In September, 1995, the Centers for Disease Control and Prevention (CDC) released recommendations for preventing the spread of vancomycin resistance.⁶ While this valuable CDC document addresses prevention and control issues in the acute care setting, it does not provide guidance for management of vancomycin resistance in other health care settings, including long-term care facilities, home health agencies, and dialysis units. In July 1996, the ADHS convened a VRE Work Group which distributed a document, "Recommendations for the Prevention of Vancomycin-Resistant Enterococci in Hospitals and Long Term Care Facilities."

The purpose of this manual is to expand the previous ADHS MRSA and VRE recommendations documents to include additional issues of VRE resistance and to adapt and expand current CDC⁶ and Hospital Infection Control Practices Advisory Committee (HICPAC)⁷ recommendations pertaining to VRE resistance to other health care settings, as appropriate.

While this manual specifically discusses guidelines relating to MRSA and VRE, it was developed to address the issue of emerging multiply resistant organisms as a group. In the past, infection control has meant control of infections in patients in acute care facilities. As the trend toward shorter hospital stays, more outpatient surgery, outpatient IV therapy and the shift to home therapy continues, we need to readjust our thinking to include non-traditional settings in our prevention and control of antibiotic-resistant organism transmission.

Because a colonization/infection may not be resolved when the patient is discharged to home, it is important that home health care agencies are made aware of current recommendations to limit transmission of antibiotic resistant organisms in these settings. Preventing and controlling the spread of all potential antibiotic-resistant bacteria in a variety of health care settings will require a coordinated, conscious effort from all individuals participating in the health care delivery system.

Elements of this effort will require (1) prudent use of antibiotics, (2) educating health care staff regarding the problems of antibiotic resistance, (3) early detection and prompt reporting of MRSA and vancomycin resistance in enterococci and other gram-positive organisms by hospital microbiology laboratories, (4) immediate implementation of appropriate infection control measures to prevent further spread and (5) meticulous communication, especially between physician's offices, hospital laboratories, home care agencies and long-term care facilities.

It is important to note that little prospective research has been done in long term care facilities and other non-acute care settings which clearly delineate differences in treatment and control measures. The following recommendations are a group of **prudent practices** believed to be feasible and efficacious in minimizing the spread of multiply resistant organisms in a variety of health care settings.

III. ARE WE SEEING MORE NOSOCOMIAL ANTIBIOTIC-RESISTANT ORGANISMS?

A. CHANGING ANTIBIOTIC RESISTANCE PROBLEMS

“There is a world crisis in antibiotic resistance which reflects in great measure the very heavy use of systemic antibiotics worldwide over the past 50 years, especially in hospitals. Over the past decade, there has been a marked upsurge in infections caused by *S. aureus* resistant to methicillin and other beta-lactams (MRSA), gram-negative bacilli resistant to aminoglycosides and other extended-spectrum beta-lactams, *C. difficile* antibiotic-associated diarrhea and colitis, and most recently, enterococci resistant to both vancomycin (VRE) and ampicillin (VAREC), and strains of pneumococci exhibiting high-level resistance to penicillin. With VAREC, for the first time we confront bacterial infections potentially resistant to *all* known commercial antibiotics.”⁸

Secular Changes in Antimicrobial Resistance ⁸

Pathogen	Antimicrobial	First Marketed Major Resistance Reported	
<i>S. pneumoniae</i>	Tetracycline	1953	1963
	Penicillin	1948	1977
<i>N. meningitidis</i>	Sulfa	1943	1963
	Penicillin	1948	1989
<i>N. gonorrhoeae</i>	Penicillin	1948	1966
<i>S. aureus</i>	Penicillin	1948	1950
	Methicillin	1959	1973
	Ciprofloxacin	1989	1990
<i>M. tuberculosis</i>	Isoniazid	1951	1953
	Isoniazid + rifampin		1986
<i>Shigella sp.</i>	Sulfonamide	1943	1959
	Ampicillin	1963	1972
<i>S. typhosa</i>	Chloramphenicol	1949	1972
<i>H. influenzae</i>	Ampicillin	1963	1974
Enteric GNRs	Gentamicin	1969	1970
<i>P. aeruginosa</i>	Amikacin	1975	1977
	3 rd Gen Cephalosporins	1981	1982
	Ciprofloxacin	1989	1990
Enterococci	Gentamicin	1969	1979
	Vancomycin	1957	1988
	Ampicillin	1963	1989
<i>Candida sp.</i>	Fluconazole	1991	1991
HSV	Acyclovir	1984	1989
CMV	Ganciclovir	1987	1989
HIV	Zidovudine	1986	1988

B. THE EPIDEMIOLOGY OF MRSA, VRE, AND VRSA

MRSA During the past decade gram-positive bacteria have emerged as the most common cause of nosocomial infection. *S. aureus* is the most frequent cause of skin and wound infections and bacteremia, and the second most frequent cause of nosocomial lower respiratory tract infections.⁹ In large teaching hospitals, the proportion of methicillin-resistant *Staphylococcus aureus* (MRSA) among nosocomial staphylococci isolates increased from 8 percent in 1986 to 40 percent in 1992.⁹ Strains of MRSA which were formerly confined to large teaching hospitals had spread by the early 1990's into smaller hospitals and into long-term care facilities.^{10,11} The majority of MRSA isolates are also resistant to most other antibiotics, necessitating the use of the glycopeptide antibiotic vancomycin.¹²

Colonization with MRSA may occur in the nares, axillae, chronic wounds or pressure ulcer surfaces, perineum, around gastrostomy and tracheostomy sites, in the sputum or urine. One of the most common sites of colonization in both patients and employees is the nose (anterior nares). As with susceptible strains of *S. aureus*, personnel may become colonized with MRSA but rarely develop infections. Infection with MRSA refers to invasion of bacteria into tissue with replication of the organism. Infection is characterized by isolation of the organism accompanied by clinical or laboratory signs of illness such as fever, elevated white blood count, purulence (pus), pneumonia, and inflammation (warmth, redness, swelling).

National Committee for Clinical Laboratory Standards⁴⁵
breakpoints for methicillin resistance when testing
staphylococci:

susceptible, $\leq 8 \mu\text{g/ml}$ or zone size $\geq 14 \text{ mm}$;

intermediate, zone size 10-13 mm;

resistant, $\geq 16 \mu\text{g/ml}$ or zone size $\leq 9 \text{ mm}$

VRE In the United States, enterococci have become the third most common organism causing hospital-acquired infections (after *S. aureus* and *E. coli*) including wound infections, urinary tract infections, septicemia, and endocarditis. From 1989 through 1993, the percentage of nosocomial enterococcal infections caused by VRE reported to CDC through the National Nosocomial Infections Surveillance (NNIS) system increased from 0.3% to 7.9%. While an increased percentage of VRE infections in non-ICU patients was noted, a 34-fold increase in the percentage of VRE-infections was noted in ICU patients, from 0.4% to 13.6%.¹³ These isolates are generally resistant to penicillin and aminoglycosides thus presenting treatment challenges.

Since long term care facilities (LTCF) have frequent interaction with acute care facilities, VRE is now being isolated with increasing frequency from residents in these facilities. The absence of laboratory confirmed VRE in a LTCF does not mean that it is not present in the resident population.

Enterococci are part of the normal flora of the human gastrointestinal tract and female genital tract where they co-exist in harmless symbiosis with their human hosts. In the past, all enterococci were

sensitive to antibiotics such as ampicillin and vancomycin. When patients are treated with antibiotics for any infection, the bacteria that are present as fellow travelers in the bowel are exposed to the antibiotic being used. Thus, when patients are treated with vancomycin for any infection, a few enterococci which are innately vancomycin resistant may survive in the bowel. These resistant organisms may then multiply free of competition resulting in colonization of the bowel with drug resistant enterococci. This is not an infection. Infection with enterococci refers to invasion of bacteria with replication of the organism accompanied by clinical and laboratory signs of illness such as fever, purulence (pus), inflammation (warmth, redness, swelling), and elevated white blood count.

National Committee for Clinical Laboratory Standards⁴⁵ breakpoints for vancomycin resistance when testing enterococci:

susceptible, $\leq 4 \mu\text{g/ml}$ or zone of $\geq 17 \text{ mm}$;

intermediate, $8\text{-}16 \mu\text{g/ml}$ or zone of $15\text{-}16 \text{ mm}$;

resistant, $\geq 32 \mu\text{g/ml}$ or zone of $\leq 14 \text{ mm}$

For isolates with vancomycin MICs of $8\text{-}16 \mu\text{g/ml}$ perform biochemical tests for identification.

Because enterococci are part of the normal bacterial flora of the gastrointestinal and female genital tracts, most enterococcal infections arise from the patient's own bacteria when subjected to illness and antibiotic therapy. However, recent reports have demonstrated that enterococci, including VRE, can be spread person-to-person (whether patient-to-patient or care provider-to-patient) or environmentally (such as by contaminated patient care equipment) resulting in colonization or infection with enterococci that are not part of the individual's normal flora. **Studies have shown that viable *Enterococcus faecalis* can be recovered from countertops for 5 days and *Enterococcus faecium* can persist for 58 days on environmental surfaces.**⁴⁶

VRSA The potential development of vancomycin resistance in *Staphylococcus* is a public health concern. *Staphylococcus* is more prevalent than *Enterococcus* and causes serious disease more frequently. Experimentally, resistance genes from VRE can be transferred to *S. aureus*.

Coagulase negative staphylococci have already been demonstrated to have reduced susceptibility to vancomycin. These staphylococci, such as *S. epidermidis* and *S. haemolyticus*, are usually less virulent than *S. aureus*.

In 1996, Japanese health officials identified a patient isolate of *S. aureus* with low-level resistance (Minimum Inhibitory Concentration (MIC) $8 \mu\text{g/ml}$) to vancomycin.¹⁴ To date, *S. aureus* strains with an intermediate level of resistance to vancomycin have been isolated in Michigan and New Jersey.^{15,16}

To decrease the likelihood of fully-vancomycin-resistant strains of staphylococci emerging in the United States will depend, in part, on actions taken now to prevent the spread of these strains in health-care facilities, including prudent vancomycin use and infection control measures such as meticulous observance of hand washing among health care providers. Hospital laboratory personnel

should be vigilant in looking for the emergence of staphylococci with decreased susceptibility to vancomycin. Current guidelines to help prevent the emergence of VRSA include the following:

- Reduce the overuse and misuse of antimicrobials
- Ensure the proper use of vancomycin by formulary decisions
- MICs using full 24 hour incubation should be used to establish antimicrobial susceptibility for staphylococci
- Any *Staphylococcus* strain with $\text{MIC} \geq 4 \mu\text{g/ml}$ should be checked for purity of culture and reconfirmed by minimum inhibitory concentration methods.
- If reduced susceptibility or resistance is confirmed, immediately contact the State Epidemiologist (602/230-5820) who will work with CDC to do further testing and an epidemiologic review
- Repeat susceptibility testing in any patient with *S. aureus* which fails to respond to vancomycin
- If VRSA is identified in a patient, contact precautions should be implemented. When possible, dedicated staff should care for the patient with a minimum number of persons having access to the patient.

National Committee for Clinical Laboratory Standards⁴⁵ breakpoints for vancomycin resistance when testing *S. aureus*:

susceptible, $\leq 4 \mu\text{g/ml}$ or zone of $\geq 15 \text{ mm}$;

intermediate, 8-16 $\mu\text{g/ml}$;

resistant, $\geq 32 \mu\text{g/ml}$

All staphylococcal isolates with zone diameters of 14 mm or less should be tested by an MIC method. Send all staphylococci determined as vancomycin resistant to the Arizona Department of Health Services Laboratory.

If a patient infected with staphylococci with decreased susceptibility to vancomycin is identified, the clinician should contact the state epidemiologist (602/230-5820) who will contact the CDC Hospital Infections Program and arrange for the isolate to be sent to CDC for confirmatory testing. Many of the infection control recommendations initially published for vancomycin-resistant enterococci would also apply to *Staphylococcus aureus* with low level resistance to vancomycin.

IV. MECHANISMS OF ANTIBIOTIC RESISTANCE

A. OVERVIEW OF ANTIBIOTIC RESISTANCE

There are at least six pathways which may be involved in the appearance or spread of resistance in bacteria.^{10,17,18} A brief description of each mechanism follows.

1. Introduction of a resistant organism into a previously susceptible population

New strains may be introduced into a facility by a patient from the outside, from a health care worker from the outside or another institution. Introduction of resistant strains into acute care facilities from long term care facilities as well as transfer in the opposite direction has been documented for certain pathogens.¹⁹ Transfer from medical settings to the community is also common. In parts of the United States, MRSA strains recently became prominent in community-acquired infections, while previously they were prevalent only in health care institutions.^{20,21}

2. Genetic mutation

Changes in only a few nucleotide base pairs can cause substitution of one or more amino acids in a crucial antibiotic target such as an enzyme, cell structure or cell wall. Genetic changes may also result in changes in chromosomal structural or control genes leading to resistant strains.²² These changes often result in resistance to a whole class of antimicrobials that were previously effective in controlling the organism.^{23,24}

3. Transfer of genetic material

Resistance can be acquired by a previously susceptible strain from another species or genus.²⁵ Many of the antimicrobial resistance genes are on plasmids that can and do transfer themselves to another genus or species of bacteria. By exchanging this loop of DNA, bacteria can become resistant to antibiotics that they have never “seen”. Although this mechanism of genetic information exchange has been known for several decades, the occurrence of this exchange network may have been underestimated.²⁶ Of particular interest is the pathway of exchange between staphylococci and enterococci.

The genes encoding β -lactamase production and high level gentamicin resistance have already moved from staphylococci into enterococci. This has resulted in resistance to penicillin, ampicillin, and the aminoglycosides and has in many cases eliminated the synergistic activity of penicillin and aminoglycosides against enterococci. Of greater concern, however, is the transfer of vancomycin resistance genes from enterococci to staphylococci. This could make *S. aureus* strains which are multiply resistant and virtually impossible to treat. Recently, a strain of *S. aureus* with intermediate resistance to vancomycin was isolated from a child in Japan¹⁴ and from two adult patients in the United States.^{15,16}

Many resistance genes encode proteins that either inactivate antimicrobial agents or block their sites of action. Subtle genetic changes in resistance determinates can have major effects on the spectrum of an organism’s resistance profile. For example, a change in a single amino acid in the protein sequence of the TEM β -lactamase, at or near the active site of the enzyme, modifies the enzyme so that other antimicrobial agents such as cephalosporins can now be hydrolyzed.^{28,29}

4. Emergence of strains with inducible resistance

Chromosomal determinants for resistance to a given drug may not be expressed until organisms come into contact with it or similar compounds. When permissive conditions appear (e.g., new

antibiotics in use) the resistance can be rapidly manifested.³⁰ The trigger for this resistance may not be the antimicrobial agent to which the resistance is directed. In some cases, exposure to another antimicrobial agent results in induction or depression of a determinant (enzyme, etc.) that stimulates resistance to the studied drug.³¹

5. Selection of resistant strains

Exposure to an antibiotic that inhibits or kills the susceptible majority of a bacterial population allows a resistant subset of strains to grow at the expense of susceptible organisms. A minority of strains present in a given population may be resistant to an antibiotic.³² The selecting factor is usually the antibiotic to which the subpopulation is resistant but it can be a related agent as well. The first antimicrobial resistance mechanism was identified in 1940 when Abraham³³ and Chain described the presence of penicillinase, an enzyme that inactivates penicillin, in *Escherichia coli*. Just four years later, Kirby reported the presence of a similar type of enzyme in *Staphylococcus aureus*.³⁴ Thus, it appears that even before penicillin was widely used, resistance was already recognized in both Gram-positive and Gram-negative organisms. In the 1970's reports of organisms resistant to penicillin-type drugs and to multiple classes of antimicrobial agents were common as nosocomial pathogens acquired a number of new resistance genes to aminoglycosides, chloramphenicol, and tetracycline.¹⁰

6. Transfer of resistance among bacteria

Vancomycin resistance has been documented in *Staphylococcus haemolyticus* and is mediated chromosomally, not by plasmid.³⁵ Although transfer of resistance between enterococci and *S. aureus* has been demonstrated *in vitro*, transfer of vancomycin resistance between enterococci and *S. aureus* has not yet been observed between clinical isolates.

2. MRSA RESISTANCE MECHANISMS

Antibiotic resistance in MRSA is mediated by two different mechanisms. First, there may be production of penicillinase, an enzyme which inactivates penicillin by destroying the β -lactam ring of penicillin which is essential for anti-staphylococcal activity. The gene for this enzyme is usually carried on an extra-chromosomal plasmid and can be transferred to penicillin-susceptible staphylococci. Most *S. aureus* now produce this enzyme and are resistant to penicillins. However, most strains are still susceptible to penicillinase-resistant semisynthetic penicillins, such as methicillin (oxacillin or nafcillin) and to cephalosporins.

The second mechanism of resistance to methicillin is intrinsic resistance.³⁶ Penicillins work by binding to a specific protein, penicillin binding protein (PBP), in the growing bacterial cell wall. The MRSA chromosome codes for a modified PBP to which methicillin and other beta-lactams cannot bind, thus making the organism resistant to these drugs. MRSA produce an abnormal PBP called PBP2a or PBP2', which is encoded on the bacterial chromosome and confers selective survival advantages for these clones of organisms. The PBP2a is the binding site for other beta-lactam drugs such as cephalosporins, monobactams, and carbapenems. Because of its abnormal recognition/binding action, the PBP2a renders MRSA resistant to all penicillins and cephalosporins and usually to beta-lactamase inhibitors such as clavulanic acid and sulbactam and even to imipenem.³⁷

Gentamicin resistance in MRSA can be chromosomally or plasmid mediated. Resistance to macrolides (e.g., erythromycin), lincosamide (e.g., clindamycin), and streptogramin (e.g.,

pristinamycin) (MLS group) is due either to methylation of ribosomal RNA or to enzymatic modification of the antibiotic.

C. VRE RESISTANCE MECHANISMS

Glycopeptide resistance is inducible and transferrable by plasmids among strains of enterococci. This is of particular importance because vancomycin is the only glycopeptide approved by the Food and Drug Administration for clinical use in the United States. Vancomycin resistant enterococci with high-level aminoglycoside resistance and β -lactamase production have been responsible for several hospital outbreaks.^{38,39}

There are many other enterococcal species, but *E. faecium* and *E. faecalis* represent 95% of clinical isolates. In addition, there are two species of enterococci - *E. gallinarum* and *E. casseliflavus* - which are inherently resistant to vancomycin. The mechanism of this resistance is chromosomally mediated in *E. gallinarum* (Van C phenotype) and unknown in *E. casseliflavus*. Most clinical isolates of these organisms represent colonization, not infection. These organisms (*E. gallinarum* and *E. casseliflavus*) have existed in nature for many years and are of low pathogenic potential therefore they are not addressed in these guidelines.

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5. PRUDENT USE OF ANTIBIOTICS

1. STRATEGIC PLAN TO DETECT, PREVENT AND CONTROL ANTIBIOTIC RESISTANT ORGANISMS

The development of antibiotic resistance has been an ongoing process since antibiotics were first introduced a half century ago. It is an evolutionary response or adaptive mechanism driven by selective pressure of heavy antibiotic use in individuals living in close proximity to others. Antibiotic resistance can readily emerge in patients who receive broad-spectrum antibiotics and who receive care from many individuals in health care settings.

Besides use of antibiotics in acute and long-term health care settings, antibiotic pressure also involves a variety of misuses of medications. These include providing antibiotics to patients who do not have infections, submitting to the demands of patients or their parents who insist on a prescription for antibiotic treatment when this will NOT be useful for what is likely a viral infection, and noncompliance with full courses of appropriate treatment in patients. It has been suggested that as much as 50% of antimicrobial use is inappropriate.⁴⁰

The strategic plan requires collaboration of infection control and quality improvement programs, pharmacy and therapeutics committees, microbiology laboratories, clinical departments, nursing, administration, and housekeeping services. All health care facilities should develop a comprehensive, institution-specific, strategic plan to detect, prevent, and control infection and colonization with multiply resistant organisms. It is strongly suggested that the following HICPAC recommendations⁶ be incorporated in the infection control plan for your facility.

All hospitals and other health-care delivery services should employ the following recommendations in prudent use of antibiotics:

- ◆ Review antimicrobial agents and select a basic formulary
- ◆ Establish prophylactic, empiric, and therapeutic guidelines
- ◆ Restrict agents that have special or limited indications, excessive toxicity or high cost
- ◆ Release restricted agents for predetermined circumstances or after prospective approval
- ◆ Coordinate susceptibility testing and reporting by the microbiology laboratory
- ◆ Monitor antibiotic susceptibility patterns and antibiotic usage trends, with periodic regular feedback to the medical staff
- ◆ Audit use of specific antibiotics
- ◆ Conduct ongoing educational programs
- ◆ Regulate in-hospital promotional efforts of pharmaceutical companies

2. APPROPRIATE USE OF VANCOMYCIN

Since vancomycin use is an important predictor of development of infection with VRE, and patients may be colonized with VRE in the absence of clinical disease, restriction of vancomycin use may be critical in preventing the spread of these organisms. Further, physicians may tend to use vancomycin inappropriately, highlighting the need for provider education and close monitoring of inappropriate vancomycin use. The following 1995 HICPAC recommendations⁶ are highlighted:

1. Situation in which the use of vancomycin is appropriate or acceptable:

- a. For treatment of serious infection due to β -lactam resistant Gram positive microorganisms. Clinicians should be aware that vancomycin may be less rapidly bactericidal than are beta-lactam agents for beta-lactam susceptible staphylococci.
- b. For treatment of infections due to Gram positive microorganisms in patients with serious allergy to beta-lactam antimicrobials.
- c. For treatment of antibiotic-associated colitis (AAC) that fails to respond to metronidazole therapy or for severe and potentially life-threatening AAC.
- d. For prophylaxis, as recommended by the American Heart Association, of endocarditis following certain procedures in patients at high risk for endocarditis.
- e. For prophylaxis or for major surgical procedures involving implantation of prosthetic materials or devices, e.g., cardiac or vascular procedures and total hip replacement, at institutions with a high rate of infections due to MRSA or methicillin-resistant *S. epidermidis*. A single dose administered immediately before surgery is sufficient unless the procedure lasts > 6 hours, in which case the dose should be repeated. Prophylaxis should be discontinued after a maximum of two doses.
- f. For patients with severe renal impairment (creatinine clearance <25 ml/min) vancomycin may be considered as primary therapy of infections caused by beta-lactam susceptible gram-positive bacteria in cases where intravenous access is limited or in cases where therapy will be administered in an outpatient setting or in an intermittent dialysis facility. It should be noted that vancomycin may be less effective than beta-lactam agents in deep seated infections such as endocarditis.

2. Situations in which the use of vancomycin should be discouraged:

- a. Routine surgical prophylaxis other than in patients with life-threatening allergy to beta-lactam antibiotics.
- b. Empiric antimicrobial therapy for a febrile neutropenic patient, unless there is strong evidence at the onset that the patient has an infection due to Gram-positive microorganisms (e.g., inflamed exit site of Hickman catheter), and the prevalence of infections due to MRSA in the hospital is substantial.

- c. For treatment in response to a single blood culture positive for coagulase-negative *Staphylococcus*, if other blood cultures drawn in the same time frame are negative. This usually represents contamination with skin flora, e.g. *S. epidermidis*. Since *S. epidermidis* is resistant to methicillin, treatment would lead to inappropriate use of vancomycin.
- d. Continued empiric use for presumed infections in patients whose cultures are negative for beta-lactam-resistant Gram-positive organisms.
- e. Systemic or local (e.g., antibiotic lock) prophylaxis for infection or colonization of indwelling central or peripheral intravascular catheters.
- f. Selective decontamination of the digestive tract.
- g. Eradication of MRSA colonization.
- h. Primary treatment of AAC.
- i. Routine prophylaxis for very low-birth weight infants.
- j. Routine prophylaxis for patients on continuous ambulatory peritoneal dialysis or hemodialysis.
- k. For patients with severe renal impairment (creatinine clearance < 25 ml/min) that have acceptable venous access and are being managed in an inpatient setting. Vancomycin should not be used solely to provide a more convenient dosing interval.
- l. Use of vancomycin for topical application or irrigation.

Vancomycin use should be monitored through continuous or intermittent quality assurance programs. Vancomycin use outside of the recommended use guidelines should be reviewed by the Pharmacy and Therapeutics Committee or other relevant group responsible for antimicrobial management. Substantial vancomycin misuse should prompt corrective interventions.

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VI. WHEN AND HOW TO OBTAIN CULTURES

A. WHEN SHOULD A CULTURE BE OBTAINED?

Culture results are valuable in decisions regarding appropriate care and treatment of patients and to facilitate appropriate infection control and prevention. Generally, cultures should be obtained as described below.

Patient consent is not needed for collection of specimens when they are done as part of acceptable infection control policy and procedure as outlined below.

1. When infection is suspected.
Cultures of appropriate clinical specimens should always be obtained and evaluated when clinical history and examination indicates that infection is likely.
2. When infection is likely if the patient/resident is colonized.
Besides clinical suspicion and in the absence of an epidemic, cultures should generally be limited to situations in which colonization is suspected and the patient/resident:
 - a. has a break in the skin (such as a pressure ulcer or open wound) or an invasive device (an IV or urinary catheter, gastrostomy tube, wound drainage or a tracheostomy); AND
 - b. has been discharged within 90 days following a hospital stay of 14 days or longer, OR;
 - c. has received within 30 days a course of antibiotic therapy lasting 14 days or longer.
3. When taking the patient/resident off precautions.
One concern about having individuals in contact isolation is the potential for negative emotional impact on the isolated person. Having baseline **Standard Precautions** that are always in place allows all types of providers to implement **transmission-based** precautions whenever an individual is infected or colonized. When additional precautions are invoked, it is important to fully explain this to the individual and family members so they understand the **organism** is the problem, not **them**. It is also critical to review this subject with them on a regular basis to answer questions they may have, especially regarding the organisms, the precautions, and the impact on the individual and their family members.

MRSA

To take a patient off Contact Precautions (in most instances patients only require Standard Precautions) **one negative culture obtained from the infected site is an indicator for termination of precautions**. This culture should be obtained at least 48 hours after completion of antibiotics used for treatment.

VRE

When a patient is initially identified as being VRE positive, **that patient must remain on precautions for the duration of the hospital stay unless the patient is documented as being negative for VRE on 3 consecutive occasions at least a week apart at all of the following sites: rectal swabs/stool cultures and previous site(s) of infection.**

4. Surveillance cultures are not warranted in most situations.
 - a. Surveillance cultures are not warranted unless there is reason to suspect an infection. Culturing of asymptomatic patients or screening of newly admitted patients is not routinely recommended even if the patient has fecal incontinence. In the absence of an outbreak, no special screening procedures are recommended.
 - b. Culturing of employees is not indicated except during an outbreak/epidemic.
 - c. Cultures of environmental surfaces and objects are indicated only as part of the investigation of an outbreak/epidemic.
 - d. When VRE-positive individuals have been newly identified, decisions to culture roommates and other patients should be made on a case-by-case basis, considering the potential for transmission in each situation and the risk of infection in the surrounding patient population (*Note: The HICPAC recommendations⁶ indicate that all roommates should be cultured. The recommendation presented here represents consensus of the work group.*)
 - e. When the VRE status of individuals is known before roommate placement, surveillance cultures of roommates are generally not indicated provided room placement has been made in accordance with recommendations outlined in section VI under “room/roommate selection” (*This represents work group consensus.*)
 - f. Some tertiary care medical centers and other hospitals that have many critically ill patients at high risk of VRE infection may choose to conduct periodic culture surveys of stool specimens or rectal swabs from such patients.

2. WHICH SITES SHOULD BE CULTURED?

1. MRSA

Staphylococcus aureus colonization of the nares, moist surfaces of skin, groin or perineum can usually be detected by culture of these sites. Clinical infection caused by *S. aureus* can almost always be identified by culturing blood, urine, wound drainage or surgically obtained specimens.

2. VRE

Currently it is not clear whether stool cultures, rectal, or perianal swab cultures provide greater sensitivity for identifying VRE-colonized patients. One study demonstrated that rectal and perianal swabs were equally sensitive in detecting VRE-positive patients. Institutions should choose the most feasible method and follow appropriate laboratory procedures for collection and transport of specimens.

3. HOW SHOULD A SPECIMEN BE OBTAINED FOR CULTURE?

Follow specific procedures for obtaining specimens for culture which have been established by the bacteriology laboratory to which the specimens are being sent. **Hands should be thoroughly washed before and after obtaining cultures. Gloves should be worn when a culture is being obtained.** General guidelines for obtaining cultures are listed below:

1. Nares (nose):

Obtain a culture using one sterile swab gently swirled in each anterior nares (the opening of each nostril) for 2-3 seconds. The same swab can be used for both nares. The swab should be placed in transport media and labeled prior to shipping to a qualified laboratory for identification and susceptibility testing. The laboratory should be instructed to screen the specimen specifically for MRSA if that is the intent.

2. Surface cultures of broken skin or weeping lesions:

Before obtaining a culture of broken skin (pressure ulcer, open wound, gastrostomy, or tracheostomy site), gently wipe the area with a sterile gauze pad moistened with sterile saline to remove exudate and surface flora. The site should then be swabbed with a sterile culture swab using a gently rolling motion; if the site is purulent, the culture should be obtained from the most heavily involved area. Avoid culturing the surface encrustation. Unroof the scab to get a good culture. The anatomical site of the specimens should be clearly indicated on the requisition slip.

3. Cultures of patients with suspected deep tissue infections, vascular catheter infections, urinary tract infections, pneumonia, and bloodstream infections:

Follow specific laboratory protocols to obtain specimens for culture.

4. Rectal cultures:

Obtain a culture using one sterile swab gently swirled in the rectum or send a stool specimen. The swab or stool culture must be placed in transport media and labeled prior to shipping to a laboratory which uses appropriate and approved methods for antimicrobial susceptibility testing methods (see Appendix C: Specific Laboratory Methods for detection of MRSA and VRE). The laboratory should be instructed to screen the specimen only for VRE.

VII. PATIENT IDENTIFICATION AND CONFIDENTIALITY

A. PRESUMPTIVE IDENTIFICATION - WHO NEEDS TO KNOW?

As soon as the presumptive diagnosis of infection/colonization with a clinically important bacterium is made, and especially if antibiotic resistance is identified, this information should be rapidly communicated to the physician, infection control staff, and the nursing unit staff.

B. ISSUES OF PATIENT CONFIDENTIALITY

A resident at risk of transmitting a multiply resistant organism, such as MRSA or VRE, to a roommate creates an ethical and legal dilemma for managers of the medical care facilities. While the individual who is infected/colonized with a resistant organism expects confidentiality concerning his/her medical condition and records, the roommate who is at risk of acquiring an infection expects that he/she will be informed of the risk and have the opportunity to take precautions necessary to minimize the risk. Reasonable people can disagree on how to balance the interests of the two individuals.

VRE, VRSA, and VISA are currently required by law to be reported to public health officials. The physician of a patient with multiply resistant organisms who wished to protect other residents from risk of contagion must act to protect those at risk, but does not have the statutory authority to disclose the medical condition of the patient without consent. Many techniques to prevent transmission are available even without disclosure. If disclosure is deemed necessary, consent for the disclosure could be sought from the patient infected/colonized with the multiply resistant organism, or from the guardian or other person legally authorized to consent on behalf of the patient, to authorize full discussion of the issues with the patient's roommate. Health care facilities are encouraged to consult their attorneys for advice on how to legally handle situations in which consent for disclosure is unavailable but it is deemed medically advisable to discuss the situation with a roommate.

SUMMARY

In the sum, there is an affirmative duty to take reasonable steps to protect those who may be at risk of contracting infection by multiply resistant organisms in a medical care facility when the risk is reasonably foreseeable. However, the actions taken to protect must be done without breach of confidentiality of the resident with a multiply resistant organism. The policy should reflect that protective actions need to be taken to benefit those residents at risk of transmission, and it should also reflect that informing the roommate or roommate's guardian of the specific medical condition without the consent of the individual infected/colonized with the multiply resistant organism, or his/her guardian, should be avoided.

Alternatively, consent could be obtained from the individual infected/colonized with the multiply resistant organism, or the guardian, to be able to fully discuss the issues with the roommate.

VIII. SPECIFIC INFECTION CONTROL RECOMMENDATIONS IN A VARIETY OF HEALTH CARE DELIVERY SETTINGS FOR MRSA, VRE AND OTHER FUTURE MULTIPLY RESISTANT ORGANISMS.

A. ACUTE CARE

Methicillin-resistant *Staphylococcus aureus*

Methicillin-resistant *Staphylococcus aureus* (MRSA) has become a prevalent nosocomial pathogen in the United States. In hospitals, the most important reservoirs of MRSA are infected or colonized patients. Although hospital personnel can serve as reservoirs for MRSA and may harbor the organism for many months, they have been more commonly identified as a link for transmission between colonized or infected patients. The main mode of transmission of MRSA is via hands (especially health care workers' hands) which may become contaminated by contact with: (a) colonized or infected patients, (b) colonized or infected body sites of the personnel themselves, or (c) devices, items, or environmental surfaces contaminated with MRSA. Standard Precautions, as described in the "Guideline for Isolation Precautions in Hospitals" (Infect Control Hosp Epidemiol 1996;17:53-80), should control the spread of MRSA in most instances.

If MRSA is judged by the hospital's infection control program to be of special clinical or epidemiologic significance, then Contact Precautions should be considered.

Vancomycin Resistant Enterococcus

Enterococci are part of the normal bacterial flora of the gastrointestinal and female genital tract. Most enterococcal infections arise from the patient's own bacteria when subjected to illness and antibiotic therapy. However, recent reports have demonstrated that enterococci, including VRE, can be spread person-to-person (whether patient-to-patient or care provider-to-patient) or environmentally (such as by contaminated patient care equipment) resulting in colonization or infection with enterococci that are not part of the individual's normal flora. **Studies have shown that viable *Enterococcus faecalis* can be recovered from countertops for 5 days and *Enterococcus faecium* can persist for 58 days on environmental surfaces.**⁴⁶

The following recommendations are intended for use in acute care facilities only. Each recommendation applies to patients with MRSA or VRE colonization/infection unless otherwise noted.

1. Handwashing

Handwashing before and after resident contacts and after removing gloves is the single most effective infection control measure known to reduce the potential for transmitting all microorganisms including MRSA and VRE in any health care facility. Consult handwashing fact sheet in Appendix M.

All **staff** who provide direct care to an individual who is known or suspected of being

infected or colonized with a multiply resistant organism should wash their hands, preferably with an antimicrobial soap.

- Any patient, **especially those with VRE**, should be reminded to wash their hands after using the toilet facilities and before mingling with others. Patients who are unable to independently wash their own hands should be assisted.
- Wash hands following contact with surfaces and equipment which may be contaminated (bed rails, tables, door knobs, telephones, commodes, etc.)
- Handwashing should occur in the sink in the patient's room or in an adjacent toilet room. When provision of handwashing facilities is not feasible, an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes can be used. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.

2. Gowns, gloves, masks, and eye protection

- Gown and gloves should be worn when providing care to patients with VRE.
- Gloves should be put on immediately prior to anticipated contact with blood and other body fluids or when touching surfaces soiled with blood or other body fluids.
- Change gloves when performing multiple procedures on a single patient if the gloves become soiled with blood and other body fluids. If the gloves become punctured or torn, handwashing should be performed before putting on clean gloves and proceeding with the care of the patient.
- Remove gloves when the specific task is completed and wash hands.
- An impervious disposable or reusable cover gown is the preferred barrier to infectious material, blood and body fluids. Sleeved aprons of liquid resistant material may be used if compliant with OSHA Rule 29 CFR part 1910.1030.
- Gowns and aprons must be removed when the procedure is completed and prior to leaving the patient's room.
- Masks and eye protection or face shields should be worn when it is anticipated that blood or other body fluids may be splashed or sprayed onto the mucous membranes of the eyes, nose, or mouth. Corrective glasses without side shields are not considered adequate eye protection.
- Shoe and head covers are not needed, even for VRE cases.

Note: When analysis of surveillance data suggests that an outbreak may be occurring, as many as 5-7 days may elapse while you are waiting for laboratory results and other epidemiologic information which may support linkage of cases. During this time, it may be helpful to initiate more stringent control measures including having **everyone** (staff and visitors) who **enters** a VRE isolation room wear gown and gloves until all data has been received and evaluated.

3. Room/roommate selection

Do not place VRE patients together with MRSA patients.

MRSA

- Cohort with other patients provided that roommates do not have severe underlying

illness, have indwelling devices (PEG tube, Foley catheter, etc.) or open wounds.

VRE

- Private room is preferred.
- Persons with active diarrhea, incontinence, poor hygiene, ileostomy, or colostomy **must** be in a private room.
- Otherwise, same as for MRSA.

4. Disinfection/environmental cleaning

Use an Environmental Protection Agency (EPA) registered disinfectant on solid surfaces including floors and furniture in areas used by patients with multiply resistant organisms. (See Appendix B for specific concentrations and exposure times for specific disinfectants.)

No special precautions need to be taken with regard to the handling of food and soiled dishes used by patients with multiply resistant organisms.

VRE

- Clean heavily soiled items with soap and water before disinfection.
- Clean and disinfect equipment before using on another person.
- Bed rails, bedside table, chair, telephone, commode, door handles and other frequently touched surfaces should be cleaned and disinfected daily and more often as needed.
- Terminal cleaning should include any surface that may have been contaminated, including cubicle curtains, furniture, walls, etc.

5. Laundry

- Contaminated laundry should be handled as little as possible with minimum agitation. Contaminated laundry should be bagged or contained at the location where it was used and should not be sorted or rinsed at the location of use.
- Contaminated laundry should be placed and transported in bags or containers labeled or color coded according to Standard Precautions.
- Whenever contaminated laundry is wet and presents a reasonable likelihood of soak-through or leakage from the bag or container, the laundry should be placed and transported in bags or containers which prevent soak-through and/or leakage of fluids to the exterior.
- The employer should ensure that employees who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment.
- When a facility ships contaminated laundry off-site to a second facility which does not use Standard Precautions in the handling of laundry, the facility generating the contaminated laundry should place such laundry in bags or containers which are labeled or color-coded to indicate risk.

6. Guidelines for activities/movement of these patients

All health care personnel involved with the VRE patient's care (including x-ray, O.R., laboratory, physical therapy, occupational therapy, etc.) must be made aware of the patient's infection/colonization and the associated precautions.

VRE

- Persons with uncontrollable diarrhea should be restricted to their rooms as much as possible.
- If physical therapy or diagnostic tests require that patients leave their rooms, have them wash their hands first and ensure that gown/pajamas/clothing are not visibly contaminated with stool or urine.

7. Patient care equipment

- Electric thermometers used to measure rectal temperatures have been implicated in VRE outbreaks and should not be used in patients with VRE colonization or infection or in patients who have diarrhea.
- Remove visible soil from reusable instruments with cool water and an enzymatic cleaning solution. Reusable or disposable equipment or instruments, such as scissors and clamps, should not be shared between patients.
- Discard disposable (non-sharps) instruments or equipment in a lined waste receptacle.

8. Chart identification and signage

Chart identification for patients with VRE is recommended. Each institution should also discuss and decide whether they should institute a policy which would also identify charts of individuals with other multiply resistant organisms including, for example, resistant Gram-negative organisms, penicillin resistant pneumococcus, and resistant *Haemophilus influenzae*.

- Medical records should be flagged and the staff at the receiving institution notified prior to the transfer of a patient with a multiply resistant organism so that appropriate infection control protocols can be put into place.
- Signs should be placed outside the room of a colonized or infected patient to remind staff to implement appropriate infection control procedures.
- The sign should be worded in such a manner as to not breach patient confidentiality or place the patient at risk for unnecessary isolation.
- Family members and visitors should be instructed to stop at the nurse's station before entering the room.
- One concern about having individuals in contact isolation is the potential for negative emotional impact on the isolated person. Having baseline **standard precautions** that are always in place allows all types of providers to implement **transmission-based precautions** whenever an individual is infected or colonized. When additional precautions are invoked, it is important to fully explain these to the individual and family members so they understand the **organism** is the problem, **not the individual**. It is also critical to review this subject with them on a regular basis to answer questions they may have, especially regarding the organisms, the precautions, and the impact on the individual and their family members.

It is critical that care providers in all settings adhere to the concept of “**isolate the organism, not the person**” when establishing infection control policies and procedures and when putting them into practice in the clinical setting.

Precautions that are beyond what is necessary to isolate the organism should not be utilized due to their potential negative impact upon the person. It is important to ensure that care providers in all settings, including temporary staff, understand the precautions that are critical for the person but that they do not go beyond what is necessary. This may cause unnecessary concerns for the person or family.

9. Visitors

- Visitors providing direct care should follow the same guidelines for barriers and hand washing procedures outlined for health care workers.
- Visitors not providing direct care should be instructed to wash hands with antimicrobial soap/hand towelette at the end of their visit in a patient's room. Gowns and gloves should be required for visitors of patients with VRE.
- No additional precautions or restrictions are required for pregnant visitors or health care workers.

10. Guidelines for admission, release and transfer of patients

a. *General Recommendations*

- **The Americans with Disabilities Act (“ADA”), 42 U.S.C. §12182 provides that no individual shall be discriminated against on the basis of disability in the full and equal enjoyment of goods, services, facilities, privileges, advantages, accommodations of any place of public accommodation (which includes hospitals, health facilities and long term care facilities) by any person who owns, leases (or leases to), or operates a place of public accommodation.** The Rehabilitation Act of 1973, 29 U.S.C.A. §794 states that no otherwise qualified individual with handicaps shall, solely because of that handicap, be excluded from participating in, be denied the benefits of, or be subjected to any discrimination under any program or activity receiving financial assistance. In many cases, persons with infectious diseases fall within the definition of a person with a “disability” or a “handicap” and are entitled to the protection of these Acts. Thus, in the majority of cases faced by health care facilities or long term care facilities, federal law requires that these care facilities or providers must admit and care for infectious disease patients, unless the facility or provider can demonstrate that it falls within an exception to the law. These exceptions are narrowly drawn. Because the law in this area is very complex, it is recommended that care facilities or providers seek legal advice to determine their legal duties and responsibilities with regard to infectious patient admissions, releases or transfer.
- All providers must be prepared to accept and care for any patient/resident regardless of their infection/colonization status.
- Today's health care environment must be viewed as a continuum where patients/residents move between levels of care according to need.
- When an individual known or suspected to be infected or colonized with a drug resistant organism is **admitted to, transferred between, discharged from, or receives treatment in** a hospital, LTCF, assisted living facility, home health agency, dialysis center or clinic, the transferring agency should notify the accepting facility of the patient's infection/colonization status.

b. *Specific Acute Care Setting Recommendations*

- Patient placement or transfer needs to be communicated to the receiving agency's Infection Control or appropriate staff before admission, whenever possible.
- Maintain documentation of known patients/residents with multiply resistant organisms to facilitate proper actions upon notification of re-admission.
- Monitor the occurrence of infected/colonized of other patients/residents with same multiply resistant organism to uncover potential clusters/outbreaks.
- Consider potential risk to roommates.

- Consider room availability and suitability of potential roommate (i.e., not immunocompromised, with open wounds, IV lines or using highly invasive equipment).
- Where possible, patient and family education is essential and should include information on where the organisms reside, the importance of containing the spread of the organisms and how the patient can participate in the control process. The question and answer sheet in Appendices D (VRE) and I (MRSA) may be helpful for this purpose.

VIII. SPECIFIC INFECTION CONTROL RECOMMENDATIONS IN A VARIETY OF HEALTH CARE DELIVERY SETTINGS FOR MRSA, VRE AND OTHER FUTURE MULTIPLY RESISTANT ORGANISMS

B. LONG TERM CARE FACILITIES (LTCF)

The following recommendations are intended for use in long term care facilities only. Each recommendation applies to patients with MRSA or VRE colonization/infection unless otherwise noted.

1. Handwashing

Handwashing before and after resident contacts and after removing gloves is the single most effective infection control measure known to reduce the potential for transmitting all microorganisms including MRSA and VRE in any health care facility. Consult the handwashing fact sheet in Appendix M.

- All **staff** who provide direct care to an individual who is known or suspected of being infected or colonized with a multiply resistant organism should wash their hands prior to and after contact with that individual, preferably with an antimicrobial soap.
- Any **resident with VRE** should be reminded to wash their hands after using toilet facilities and before mingling with others. Assist the resident with hand washing if they are unable to do so on their own.
- Any **visitors** should wash their hands prior to resident contact, following contact with blood or other body fluids, before and after feeding the resident, and before and following contact with other residents.
- Wash hands with soap and running water:
 1. following accidental ungloved contact with blood or other liquid or semi-liquid body fluids such as urine, feces, wound drainage, gastric drainage or the mucous membranes of the mouth and nose, and open lesions or wounds on the skin;
 2. following the removal of gloves;
 3. following prolonged contact with clean dry intact skin for the purpose of providing physical, occupational, speech or recreational therapy and after assisting with feeding a resident;
 4. following short contacts of less than one minute duration with the resident's clean, dry intact skin or when feeding multiple residents at one time;
 5. between contact with multiple residents; and
 6. following contact with surfaces and equipment which may be contaminated (bed rails, tables, and commodes).
- Use disposable paper towels to dry hands. Avoid touching environmental surfaces such as bedside rails and other resident's equipment after handwashing.
- Handwashing should occur in the sink in the resident's room or in an adjacent toilet room. When provision of handwashing facilities is not feasible, an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes can be used. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.

2. Gowns, gloves, masks, and eye protection

- For persons who are mobile and socially interactive, the need for the caregiver to wear gloves can be limited to situations involving significant contact with stool or other body fluids and exudate when infection exists.
- For persons who are bedridden and require significant direct care, gowns and gloves should be worn by staff providing that care.
- Gown and gloves should be worn when providing care if soiling is likely.
- Gloves should be put on immediately prior to anticipated contact with blood and other body fluids or when touching surfaces soiled with blood or other body fluids.
- Change gloves when performing multiple procedures on a single patient if the gloves become soiled with blood or other body fluids. If the gloves become punctured or torn, hand washing should be performed before putting on clean gloves and proceeding with the care of the patient.
- Remove gloves when the specific task is completed and wash hands.
- An impervious disposable or reusable cover gown is the preferred barrier to blood and body fluids. Sleeved aprons of liquid resistant material may be used in compliance with OSHA Rule 29 CFR part 1910.1030.
- Gowns and aprons must be removed when the procedure is completed and prior to leaving the resident's room.
- Masks and eye protection or face shields should be worn when it is anticipated that blood or other body fluids may be splashed or sprayed onto the mucous membranes of the eyes, nose, or mouth. Corrective glasses without side shield are not adequate eye protection.
- Shoe and head covers are not needed, even for VRE cases.

3. Room/roommate selection

Remember: Do not place VRE residents in the same room with MRSA residents.

a. Rectal colonization with VRE in a patient with diarrhea or fecal incontinence, OR any exudate known to contain VRE that cannot be contained:

Room and roommate selection will sometimes be difficult for a resident with VRE colonization who has diarrhea or is fecally incontinent. **Do the best you can to minimize the risk of exposing other residents.** As you read the options below, keep in mind that option 1 is the first choice, then option 2 if all else is not possible.

1. A single room is preferable. This can be accomplished by:
 7. Placing the resident in a designated private room;
 8. Transferring the VRE colonized/infected resident to a double room and leaving the other bed unoccupied; or
 9. Transferring the roommate to another room and leaving that bed unoccupied.

[Comment: While this is the preferred room assignment, the facility may not be able to

physically provide a single room and financially may not be able to afford keeping a bed unoccupied for long periods of time. In these instances, follow protocol a.2.]:

2. A double room is acceptable until a single room is available.

- a. The infection control professional must increase the monitoring of staff to assure compliance with infection control measures (i.e., handwashing, barriers, aseptic technique).
2. Increase the frequency of environmental cleaning in the residents room. Housekeeping may need to schedule extra visits and be available to disinfect the resident's room as needed.

*[Rational: Placement of a colonized/infected resident who is incontinent of stool or has exudate known to contain VRE in a double room is acceptable **but should be temporary**. The roommate should not have open areas of the skin, indwelling lines or tubes, and not be immune compromised except for being elderly. Careful attention to precautions should be followed by facility staff **until a single room becomes available or the resident becomes continent and exudate can be contained.**]*

b. If the VRE colonized/infected resident IS continent of stool AND any exudate known to contain VRE can be contained:

Remember: Do not place a VRE resident with a MRSA resident.

1. A single room is preferable. If all else is "equal", an infected resident should have priority over a colonized resident for the single room. This can be accomplished by:
 - a. Placing the resident in a designated private room;
 - b. Transferring the VRE colonized/infected resident to a double room and leaving the other bed unoccupied; or
 - c. Transferring the roommate to another room and leaving that bed unoccupied.

[Rationale: While this is the preferred room assignment, the facility may not be able to physically provide a single room and financially may not be able to afford to keep a bed unoccupied for long periods of time. In these instances, follow protocol b. 2.]

2. A roommate is acceptable.

(Placement of a colonized/infected resident with another resident in a double room is acceptable. The roommate should not have open areas of skin, indwelling lines or tubes, and not be immune compromised except for being elderly or the roommate should be known to be colonized/infected with VRE).

*[Rationale: Protocols b.1. and b.2. should accommodate many circumstances involving VRE colonized/infected residents. However, many long term care facilities have severe limitations for transferring residents within the facility. For those instances when a single room or an appropriate roommate are unavailable, when hospitalization of the resident is not appropriate and the **ONLY** option is to keep a colonized/infected resident in a room where the roommate has open areas on the skin, indwelling tubes or lines or is*

immunocompromised, follow protocol b.3.]

3. Extra precautions should be followed by facility staff **until a single room or room with an appropriate roommate becomes available.**

1. The infection control professional must increase the monitoring of staff to assure compliance with infection control measures (i.e., handwashing, barriers, aseptic technique).
2. Increase the frequency of environmental cleaning in the resident's room including the bathroom if a dedicated commode is not used. If the colonized/infected resident uses a dedicated commode, extra attention must be paid to disinfection and cleaning after each use. Housekeeping may need to schedule a second daily visit and be available to clean and disinfect the resident's room as needed.

4. Disinfection/environmental cleaning

Use an Environmental Protection Agency (EPA) registered disinfectant on solid surfaces including floors and furniture in areas used by patients with multiply resistant organisms. (See Appendix B for specific concentrations and exposure times for specific disinfectants.)

No special precautions need to be taken with regard to the handling of food and soiled dishes used by patients with multiply resistant organisms.

- Clean items with soap and water prior to disinfection.
- Disinfect equipment before removing from the room and using on another resident.
- Bed rails, bedside table, chair, commode and door handles should be cleaned and disinfected daily and more often as needed.

5. Laundry

- Do not pre-rinse stool soiled linens.
- Contaminated laundry should be handled as little as possible with minimum agitation. Contaminated laundry should be bagged or contained at the location where it was used and should not be sorted or rinsed at the location of use.
- Contaminated laundry should be placed and transported in bags or containers labeled or color-coded according to Standard Precautions.
- Whenever contaminated laundry is wet and presents a reasonable likelihood of soak-through or leakage from the bag or container, the laundry should be placed and transported in bags or containers which prevent soak-through and/or leakage of fluids to the exterior.
- The employer should assure that employees who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment.
- When a facility ships contaminated laundry off-site to a second facility which does not use Standard Precautions in the handling of laundry, the facility generating the contaminated laundry should place such laundry in bags or containers which are labeled or color-coded.

6. Guidelines for activities/movement of these patients

- If the resident is continent, emphasize good hygiene and allow the patient to

participate in activities and eat in the general dining area.

- If therapy, diagnostic tests, etc., require that residents with VRE leave their rooms, have them wash their hands first, make sure their wounds are covered with a clean dressing, and assure that gowns or clothing are not contaminated with stool or urine. Assist the resident with handwashing if they are unable to do so on their own.

7. Guidelines for admission, release and transfer of patients

a. *General Considerations*

- **The Americans with Disabilities Act (“ADA”), 42 U.S.C. §12182 provides that no individual shall be discriminated against on the basis of disability in the full and equal enjoyment of goods, services, facilities, privileges, advantages, accommodations of any place of public accommodation (which includes hospitals, health facilities and long term care facilities) by any person who owns, leases (or leases to), or operates a place of public accommodation.** The Rehabilitation Act of 1973, 29 U.S.C.A. §794 states that no otherwise qualified individual with handicaps shall, solely because of that handicap, be excluded from participating in, be denied the benefits of, or be subjected to any discrimination under any program or activity receiving financial assistance. In many cases, persons with infectious diseases fall within the definition of a person with a “disability” or a “handicap” and are entitled to the protection of these Acts. Thus, in the majority of cases faced by health care facilities or long term care facilities, federal law requires that these care facilities or providers must admit and care for infectious disease patients, unless the facility or provider can demonstrate that it falls within an exception to the law. These exceptions are narrowly drawn. Because the law in this area is very complex, it is recommended that care facilities or providers seek legal advice to determine their legal duties and responsibilities with regard to infectious patient admissions, releases or transfer.
- All providers must be prepared to accept and care for any patient/resident regardless of their infection/colonization status.
- Today’s health care environment must be viewed as a continuum where patients/residents move back and forth across levels of care according to need.
- When an individual known or suspected to be infected or colonized with a multiply resistant organism is **admitted to, transferred between, discharged from, or receive treatment in a** hospital, LTCF, assisted living facility, home health agency, dialysis unit, or clinic, the transferring agency should notify the accepting facility of the individual’s infection/colonization status.

b. *Specific Long Term Care Setting Recommendations*

- When placing resident, consider the risk/benefit and degree of disruption from changes in room assignments based on the reality that colonization can persist indefinitely and the level of interaction of the resident with the facility environment.
- The medical director should be notified of the placement of all residents with multiply resistant organisms.
- Infection Control staff in the receiving agency must be notified when a patient/resident with a multiply resistant organism is being considered for admission or transfer so precautions can be instituted, including staff and resident education on control of multiply resistant organisms.

8. Patient care equipment

- Dedicate appropriate equipment to a resident in isolation including their own mercury/digital thermometer.

- Electric thermometers used for measuring rectal temperatures have been implicated in VRE outbreaks and should not be used with patients with VRE colonization or infection.
- Remove visible soil from reusable instruments with cool water and an enzymatic cleaning solution and disinfect with an EPA approved disinfectant. Reusable or disposable equipment or instruments, such as scissors and clamps, should not be shared between patients.
- Discard disposable (non-sharp) instruments or equipment in a lined waste receptacle.

9. Chart identification and signage

Chart identification for patients with VRE is recommended. Each institution should also discuss and decide whether they should institute a policy which would also identify charts of individuals with other multiply resistant organisms including, for example, resistant Gram-negative organisms, penicillin resistant pneumococcus, and resistant *Haemophilus influenzae*.

- Medical records should be flagged and the staff at the receiving institution should be notified prior to the transfer of a patient with a multiply resistant organism so that appropriate infection control protocols can be invoked.
- A sign should be placed outside the room of a colonized or infected resident in such a manner that it will remind staff to implement appropriate infection control procedures.
- The sign should be worded in such a manner as to maintain patient confidentiality or place the patient at risk for unnecessary isolation.
- Family members and other visitors should be instructed to stop at the nurse's station before entering the room.
- One concern about having individuals in contact isolation is the potential for negative emotional impact on the isolated person. Having baseline **standard precautions** that are always in place allows all types of providers to implement **transmission-based precautions** whenever an individual is infected or colonized. When additional precautions are invoked, it is important to fully explain this to the individual and family members so they understand the **organism** is the problem, **not them**. It is also critical to review this subject with them on a regular basis to answer questions they may have, especially regarding the organisms, the precautions, and the impact on the individual and their family members.

It is critical that care providers in all settings adhere to the concept of **“isolate the organism, not the person”** when establishing infection control policies and procedures and when putting them into practice in the clinical setting.

Precautions that are beyond what is necessary to isolate the organism should not be utilized due to their potential negative impact upon the person. It is important to ensure that care providers in all settings, including temporary staff, understand the precautions that are critical for the person but that they do not go beyond what is necessary. This may cause unnecessary concerns for the person or family.

10. Visitors

- Visitors should be instructed to wash hands with soap at the end of their visit in a resident's room.
- Visitors providing direct care should follow the same guidelines for barriers and hand washing procedures outlined for health care workers.
- No additional precautions or restrictions are required for pregnant visitors or health care workers.

11. Antibiotic usage

- Antibiotics, both oral and parenteral, should only be used to treat residents with suspect or documented clinical infections, not colonization.
- The facility Infection Control Committee should monitor all antibiotics administered, the indications for which the antibiotic was ordered and the outcome of the resident receiving antibiotic therapy.
- Criteria for using specific antibiotics should be developed and all physicians should be informed of the criteria.
- Antibiotics such as vancomycin and 2nd and 3rd generation cephalosporins should not be used when the clinical effectiveness of another class of antibiotics for treating the infection in question has been described in the literature.

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VIII. SPECIFIC INFECTION CONTROL RECOMMENDATIONS IN A VARIETY OF HEALTH CARE DELIVERY SETTINGS FOR MRSA, VRE AND OTHER FUTURE MULTIPLY RESISTANT ORGANISMS

C. HOME HEALTH/HOME HOSPICE

Recent trends in medical care have resulted in a shorter patient stay in acute care facilities and an increase in the number of patients being cared for in their homes. Recently, many home health and home hospice patients have been discharged from acute care facilities where there has been a significant increase in the incidence of multiply resistant infections/colonizations. Because a colonization/infection may not be resolved when the patient is discharged to home, it is important that home health agencies and home hospices are made aware of and implement policies to prevent the transmission of multiply resistant organisms in the home. The main focus of the following recommendation is reduction of risk of transmission to other clients because health care workers visit multiple clients in their homes each day.

The following recommendations are intended for use in home health and home hospice settings only. Each recommendation applies to patients with MRSA or VRE colonization/infection unless otherwise noted.

1. Handwashing

- Hands should be thoroughly washed upon entering the home, after gloves are removed and prior to exiting the home.
- When possible, hands should be washed in the client's bathroom or the closest sink available. When provision of handwashing facilities is not feasible, an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes can be used. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.
- Home care staff should use single use towels and soap to avoid cross contamination from those used by the patient or other members of their household.
- Towels may be discarded in the usual trash disposal system.
- Home health patients, their family members and other household members should be instructed and given written information describing the mechanisms in which multiply resistant organisms are transmitted and the need for strict compliance with handwashing and other aseptic methods to prevent the spread of the organism within the household. Consult the handwashing fact sheet in Appendix M.

2. Gowns, gloves and masks

- Care givers should wear gloves when treating or having close contact with a patient colonized/infected with a multiply resistant organism who is incontinent of urine or stool, whose wound exudate cannot be contained or when contact with blood, stool, open secretions and excretions can be anticipated.
- Gowns and gloves are always appropriate for care givers providing significant care to persons who are bedridden.
- For persons who are mobile and socially interactive, the need for the care giver

to wear gloves can be limited to situations involving direct contact with stool or other body fluids and exudate where infection exists.

- Gloves without visible contamination may be discarded in the usual trash.
- Gloves with visible exudate, feces or other body fluids should be placed in a plastic bag to maintain a sanitary environment in the home and placed into the household trash.
- Home health care staff should wear gloves when cleaning the home of patients colonized/infected with VRE and in homes of patients with poor hygienic practices.
- The routine use of a mask for home health care staff caring for a patient colonized/infected with multiply resistant organisms is not necessary. Home care staff may choose to wear a mask and eye protection when in close proximity to a patient and when there is a possibility that infected body fluids or exudate may become aerosolized, i.e., a patient known to be colonized/infected with a multiply resistant organism in the nares, throat or lungs who has a chronic cough or may discharge exudate from a tracheostomy tube.
- Shoe and head covers are not needed, even for VRE cases.

3. Room selection

- There is no need to disrupt sleeping arrangements in the home

4. Chart identification

- Medical records, if kept at the home, should be flagged and the staff at the receiving institution should be notified prior to the transfer of a patient with a multiply resistant organism so that appropriate infection control protocols can be put into place.

5. Disinfection/environmental cleaning

Use an Environmental Protection Agency (EPA) registered disinfectant on solid surfaces including floors and furniture in areas used by patients with multiply resistant organisms. (See Appendix B for specific concentrations and exposure times for specific disinfectants.)

No special precautions need to be taken with regard to the handling of food and soiled dishes used by patients with multiply resistant organisms.

- Patient and family care givers should be taught the importance of prompt cleaning and disinfection of bathrooms and other environmental surfaces that may become contaminated with fecal material or other patient secretions/excretions.
- At home or in the hospice, the sink and toilet that the infected/colonized person uses should be cleaned and disinfected daily.
- Home health care staff should wear gloves when cleaning the home of patients colonized/infected with VRE and in homes of patients with poor hygienic practices.

6. Linens

- Linens heavily soiled with drainage secretions or excretions should be washed separately using manufacturer's recommended amounts of detergent.
- Clothing not heavily soiled with urine and stool should be placed in laundry hampers and processed with other linen.

7. Patient care equipment

- Electronic thermometers used for taking rectal temperatures have been implicated in VRE outbreaks and should not be used with patients with VRE colonization or infection.
- As much as possible, provide each patient colonized/infected with VRE with their own individual supplies to be left in the home/room including thermometer, stethoscopes, and blood pressure cuff.
- If use of equipment that is to be later used on other patients is required, appropriate cleansing and disinfecting after client contact should be followed (see Appendix B).
- Efforts to control transmission of resistant organisms in the patient's home should focus on preventing cross-contamination via the nursing bag, clothing, equipment which is carried to and from the home by the health care professional.

8. Guidelines for activities/movement of patients

- At home, emphasize good hygiene. The person should be encouraged to participate in family activities.
- To decrease the risk of cross contamination, the patient/resident should be instructed or assisted with handwashing prior to leaving the room. If the client is unable to independently wash their hands, they should be assisted.

9. Visitors

- Individuals providing direct care should be instructed to wash hands before leaving the home.
- All visitors including social visitors should wash their hands with soap and water before leaving the house.
- When possible, visitors who are not feeling well should reschedule their visit in the home or in the hospice environment.

10. Guidelines for admission, release and transfer of patients

a. *General Recommendations*

- **The Americans with Disabilities Act ("ADA"), 42 U.S.C. §12182 provides that no individual shall be discriminated against on the basis of disability in the full and equal enjoyment of goods, services, facilities, privileges, advantages, accommodations of any place of public accommodation (which includes hospitals, health facilities and long term care facilities) by any person who owns, leases (or leases to), or operates a place of public accommodation. The Rehabilitation Act of 1973, 29 U.S.C.A. §794 states that no otherwise qualified individual with handicaps shall, solely because of that handicap, be excluded from participating in, be denied the benefits of, or be subjected to any discrimination under any program or activity receiving financial assistance. In many cases, persons with infectious diseases fall within the definition of a person with a "disability" or a "handicap" and are entitled to the protection of these Acts. Thus, in the majority of cases faced by health care facilities or long term care facilities, federal law requires**

that these care facilities or providers must admit and care for infectious disease patients, unless the facility or provider can demonstrate that it falls within an exception to the law. These exceptions are narrowly drawn. Because the law in this area is very complex, it is recommended that care facilities or providers seek legal advice to determine their legal duties and responsibilities with regard to infectious patient admissions, releases or transfer

- All providers must be prepared to accept and care for any patient regardless of their infection/colonization status.
- Today's health care environment must be viewed as a continuum where patients move between levels of care according to need.
- When an individual known or suspected to be infected or colonized with a multiply resistant organism is **admitted to, transferred between, discharged from, or receives treatment in** a hospital, LTCF, assisted living facility, home health agency, dialysis unit, hospice or clinic, the transferring agency should notify the accepting facility of the patient's infection/colonization status. This should include notification of laboratory staff coming to a home to draw blood.

b. *Specific Home Health/Home Hospice Setting Recommendations*

- Notification of the health provider regarding patient status is just as important in this setting as in the acute or long term care setting.
- When a home health or home hospice patient requires in-patient care, the infection control staff in the receiving agency must be notified when a patient with multiply resistant organisms is being considered for admission or transfer so preparations can be made including staff education on control of multiply resistant organisms.

VIII. SPECIFIC INFECTION CONTROL RECOMMENDATIONS IN A VARIETY OF HEALTH CARE DELIVERY SETTINGS FOR MRSA, VRE AND OTHER FUTURE MULTIPLY RESISTANT ORGANISMS

D. DIALYSIS UNITS

The following recommendations are intended for use in out-patient hemodialysis units only. In-patient units should follow the recommendations for acute care facilities. Each recommendation applies to patients with MRSA or VRE colonization/infection unless otherwise noted.

1. Handwashing

- All **staff** who provide direct care to an individual who is known or suspected of being infected or colonized with a multiply resistant organism should wash their hands, preferably with an antimicrobial soap.
- Handwashing should occur in the sink in the patient's room or in an adjacent toilet room. When provision of handwashing facilities is not feasible, an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes can be used. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible
- Any person, **especially those with VRE**, should be reminded to wash their hands after using toilet facilities and before mingling with others.

2. Gowns, gloves, masks and eye protection

- Gloves and gowns should be worn when having close contact with a patient colonized/infected with a multiply resistant organism.
- Gloves should be changed before preceding with treatment of other patients.
- Hands should be thoroughly washed after gloves are removed.
- Gloves should be for single patient use and not be used to provide care for more than one patient.
- The routine use of a mask and eye protection for treating a dialysis patient colonized/infected with a multiply resistant organism is not necessary. Staff may choose to wear a mask and eye protection when in close proximity to a patient and there is a possibility that infected body fluids or exudate may become aerosolized (i.e., a patient known to be colonized/infected with a multiply resistant organism in the nares, throat or lungs who has a chronic cough or who may discharge exudate from a tracheotomy tube).
- Shoe and head covers are not needed, even for VRE cases.

3. Treatment room selection

- Multiple patients colonized/infected with the same multiply resistant organism may be cohorted in a distinct area and have designated staff person(s) take care of them.
- Private rooms or separate areas are not necessary **EXCEPT** when the individual has:
 - a VRE infection/colonization in stool or urine that cannot be contained;
 - exudate from infected wounds that cannot be contained by a dressing; or
 - other mental or medical conditions that warrant use of a private room

or separate area

Note: separate areas can be developed by having a physical barrier between patients using curtains or screens.

4. Chart identification and signage

- Medical records should be flagged and the staff at the receiving institution should be notified prior to the transfer of a patient with a multiply resistant organism so that appropriate infection control protocols can be put into place.

5. Disinfection/environmental cleaning

Use an Environmental Protection Agency (EPA) registered disinfectant on solid surfaces including floors and furniture in areas used by patients with multiply resistant organisms. (See Appendix B for specific concentrations and exposure time for specific disinfectants.)

- It is known that VRE contaminates environmental surfaces such as bed rails and tables. It is therefore possible for hands to be passively recontaminated if these surfaces are touched prior to leaving the patient's area even though appropriate handwashing procedures were followed prior to interaction with the patient.
- Dialysis machines should be cleaned and disinfected after the treatment is initiated and all adjustments to the machine are complete with special attention made not to contaminate the surface of the machine. In situations when handwashing cannot be done following patient care, prior to adjusting the dialysis machine, the machine should again be cleaned and disinfected. If possible, staff who do not participate in the initiation of the treatment should clean the machine.
- Dialysis machines, chairs and other environmental items (bedpans, emesis basins, thermometers, blood pressure cuffs, stethoscopes, etc.) Used in the care of dialysis patients should be thoroughly cleaned and disinfected before use by other patients.
 - Assign each patient colonized/infected with VRE with their own individual supply tray (tourniquet, antiseptics, clamps, etc.) and, if possible, with their own thermometer, stethoscope and blood pressure cuff.
 - Dialyzer reuse is acceptable for patients colonized/infected with multiply resistant organisms.
 - Dialysis patients with VRE colonization/infection should be discouraged from handling any dialysis equipment except for implementing emergency "take-off" procedures.

6. Linens

- Blankets, sheets and pillow covers should be cleaned before being used by other patients.
- There are no special procedures to be used when washing items used by patients.
- Linens heavily soiled with urine and stool should be washed separately.

7. Guidelines for activities/movement of these patients

- Clean and disinfect toilet and sink handles after patient use.
- No other restrictions are necessary.

8. Guidelines for admission, release and transfer of patients

a. *General Recommendations*

- **The Americans with Disabilities Act (“ADA”), 42 U.S.C. §12182 provides that no individual shall be discriminated against on the basis of disability in the full and equal enjoyment of goods, services, facilities, privileges, advantages, accommodations of any place of public accommodation (which includes hospitals, health facilities and long term care facilities) by any person who owns, leases (or leases to), or operates a place of public accommodation.** The Rehabilitation Act of 1973, 29 U.S.C.A. §794 states that no otherwise qualified individual with handicaps shall, solely because of that handicap, be excluded from participating in, be denied the benefits of, or be subjected to any discrimination under any program or activity receiving financial assistance. In many cases, persons with infectious diseases fall within the definition of a person with a “disability” or a “handicap” and are entitled to the protection of these Acts. Thus, in the majority of cases faced by health care facilities or long term care facilities, federal law requires that these care facilities or providers must admit and care for infectious disease patients, unless the facility or provider can demonstrate that it falls within an exception to the law. These exceptions are narrowly drawn. Because the law in this area is very complex, it is recommended that care facilities or providers seek legal advice to determine their legal duties and responsibilities with regard to infectious patient admissions, releases or transfer
- All providers must be prepared to accept and care for any patient regardless of their infection/colonization status.
- Today’s health care environment must be viewed as a continuum where patients move between levels of care according to need
- When an individual known or suspected to be infected or colonized with a multiply resistant organism is **admitted to, transferred between, discharged from, or receives treatment in** a hospital, LTCF, assisted living facility, home health agency, or dialysis unit or clinic, the transferring agency should notify the accepting facility of the patient’s infection/colonization status.

b. *Specific Dialysis Unit Recommendations*

Several factors should be considered before transfer or acceptance of transient patients who are infected/colonized with multiply resistant organisms, including:

- Intensity of care needs and degree of anticipated contact with excretions/secretions or wound drainage.
- Patient’s ability to control secretions and excretions.
- Presence of other patients who are infected/colonized with the same multiply resistant organism.
- Potential risk to other patients.
- Treatment room/area availability and suitability.
- In all cases in this category, intensive patient and staff education is essential.

9. Other recommendations

- Visitors of hemodialysis patients should be instructed to wash their hands before entering the unit and prior to leaving the unit.
- Visitors of patients at high risk of disease transmission should be instructed on the proper use of protective barriers, i.e., masks, gloves, gowns.
- Non-patient care staff (social workers, dieticians, technicians) should follow the same recommendations as patient care staff.

10. Recommendations for the control of intravascular device-related infections

- The use of aseptic technique (mask for staff and patient and sterile gloves for staff and patient if participating in the process) should be considered to initiate and terminate hemodialysis treatments through an intravascular access.
- Apply povidone-iodine to the catheter insertion site at each dressing change. Two percent chlorhexidine gluconate or 70% alcohol may be used in place of povidone-iodine.
- Clean injection ports with povidone-iodine or 70% alcohol before accessing the system.
- If occlusive transparent dressings are used instead of gauze and tape dressings, the product should allow the escape of moisture from beneath the dressing.

[Rationale: Centers for Disease Control and Prevention. Guideline for Prevention and Control of Intravascular Device-Related Infections. Am J Infect Control 1996;24:262-293.]

Although the rate of MRSA carriage among hemodialysis patients is unknown, studies indicate that 50% to 62% have been found to be carriers of Staphylococcus aureus. Nasal carriage with S. aureus may result in seeding the skin leading to insertion site infections and blood stream infections. While blood stream infections are caused most frequently by Staphylococcus epidermidis, hemodialysis patients, because of their high rate of carriage with S. aureus have a greater proportion of catheter-related blood stream infections due to S. aureus than other patient populations. Subclavian hemodialysis catheters have been associated with a higher rate of blood stream infections than virtually all other subclavian catheters of alternative forms of vascular accesses used in hemodialysis including jugular accesses. Internal jugular catheters may, however, pose a greater risk of access site infection than a subclavian catheter due to their close proximity to oropharyngeal secretions and their difficulty to immobilize.

Risk factors associated with VRE blood stream infections include receipt of antimicrobials, gastrointestinal colonization with VRE, underlying disease severity, abdominal or cardiac procedures, use of indwelling catheters and prolonged hospital stay.

MRSA and VRE, as part of the endogenous flora of hemodialysis patients or introduced on the contaminated hands of health care workers, may account for a large percentage of the infections. In addition, environmental surfaces contaminated with VRE have a role in the transmission of the disease.]

VIII. SPECIFIC INFECTION CONTROL RECOMMENDATIONS IN A VARIETY OF HEALTH CARE DELIVERY SETTINGS FOR MRSA, VRE AND OTHER FUTURE MULTIPLY RESISTANT ORGANISMS

E. ADULT DAY CARE/ASSISTED LIVING FACILITIES

1. Handwashing

- All **staff** who provide direct care to an individual who is known or suspected of being infected or colonized with an antibiotic resistant organism should wash their hands.
- Handwashing should occur in the sink in the patient's room or in an adjacent toilet room. When provision of handwashing facilities is not feasible, an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes can be used. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.
- Any person, **especially those with VRE**, should be reminded to wash their hands after using toilet facilities and before mingling with others.

2. Gowns, gloves and masks

- Gloves and gowns should be worn when having close contact with a individual colonized/infected with a multiply resistant organism who is incontinent of urine or stool, or who has wound exudate that can not be contained.
- Gloves should be removed after the specific task is completed.
- Hands should be thoroughly washed after gloves are removed.
- Staff may choose to wear a mask when in close proximity to a client and when there is a possibility that infected body fluids or exudate may become aerosolized, i.e., an individual known to be colonized/infected with a multiply resistant organism in the nares, throat or lung who has a chronic cough or may discharge exudate from a tracheostomy tube.
- Shoe and head covers are not needed, even for VRE cases.

3. Room/roommate selection

- Multiple individuals colonized/infected with the same multiply resistant organism may be cohorted in a distinct area and have designated staff person(s).
- Private rooms or separate areas are not necessary **EXCEPT** when the individual has:
 - VRE infection/colonization in stool or urine that cannot be contained;
 - exudate from infected wounds cannot be contained by a dressing; or
 - other mental or medical conditions that warrant use of a private room or separate area.

4. Disinfection/environmental cleaning

Use an Environmental Protection Agency (EPA) registered disinfectant on solid surfaces including floors and furniture in areas used by patients with multiply resistant organisms. (See Appendix B for specific concentrations and exposure time for specific disinfectants.)

No special precautions need to be taken with regard to the handling of food and soiled dishes used by patients with multiply resistant organisms.

5. Linens

- Blankets, sheets and pillow covers should be cleaned before being used by other individuals.
- There are no special procedures to be used when washing items used by individuals in these settings.
- Linens heavily soiled with urine and stool should be washed separately.

6. Guidelines for activities/movement of individuals in these settings

- Clean toilet and sink handles after patient use.
- No other restrictions necessary.
- The facility is generally considered a client's home.
- Clients with VRE should be allowed to ambulate, socialize normally and participate in group activities as long as body substances are contained.
- Where appropriate, enhanced barrier protection to contain a body substance is preferred over restriction of the client.
- To decrease the risk of cross contamination, the client should be instructed or assisted with hand washing prior to leaving the room.

7. Guidelines for admission, release and transfer of patients

a. *General Recommendations*

- **The Americans with Disabilities Act ("ADA"), 42 U.S.C. §12182 provides that no individual shall be discriminated against on the basis of disability in the full and equal enjoyment of goods, services, facilities, privileges, advantages, accommodations of any place of public accommodation (which includes hospitals, health facilities and long term care facilities) by any person who owns, leases (or leases to), or operates a place of public accommodation.** The Rehabilitation Act of 1973, 29 U.S.C.A. §794 states that no otherwise qualified individual with handicaps shall, solely because of that handicap, be excluded from participating in, be denied the benefits of, or be subjected to any discrimination under any program or activity receiving financial assistance. In many cases, persons with infectious diseases fall within the definition of a person with a "disability" or a "handicap" and are entitled to the protection of these Acts. Thus, in the majority of cases faced by health care facilities or long term care facilities, federal law requires that these care facilities or providers must admit and care for infectious disease patients, unless the facility or provider can demonstrate that it falls within an exception to the law. These exceptions are narrowly drawn. Because the law in this area is very complex, it is recommended that care facilities or providers seek legal advice to determine their legal duties and responsibilities with

- regard to infectious patient admissions, releases or transfer
- All providers must be prepared to accept and care for any client regardless of their infection/colonization status.
- Today's health care environment must be viewed as a continuum where individuals move between levels of care according to need.
- When an individual known or suspected to be infected or colonized with a multiply resistant organism is **admitted to, transferred between , discharged from, or receives treatment in** a hospital, LTCF, assisted living facility, home health agency should notify the accepting facility of the client's infection/colonization status.

b. *Specific Adult Day Care, Community Based Residential/Assisted Living Facility Recommendations*

Several factors should be considered before transferring a patient/resident who is infected/colonized with multiply resistant organisms, including:

- Intensity of care needs and degree of anticipated contact with excretions/secretions or wound drainage.
- Client ability to control secretions and excretions.
- Client level of activity and mobility, including expected interaction with other patients/residents in that facility.
- Presence of other clients who are infected/colonized with the same multiply resistant organism.
- Potential risk to roommates, when applicable.
- Room availability and suitability (i.e., not immunocompromised, with open wounds, multiple IV lines or using highly invasive equipment).
- In all cases in this category, intensive client education is essential.

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VIII. SPECIFIC INFECTION CONTROL RECOMMENDATIONS IN A VARIETY OF HEALTH CARE DELIVERY SETTINGS FOR MRSA, VRE AND OTHER MULTIPLY RESISTANT ORGANISMS

F. AMBULANCES, CARE VANS

Infection control measures should be implemented by persons who transport patients/residents known to be infected or colonized with a multiply resistant organism. These recommended guidelines should be implemented by ambulance personnel, care van drivers and other individuals when transporting persons known to be infected or colonized with a multiply resistant organism in non-emergency situations.

1. *Guidance to the discharging facility*

When a person known to be infected or colonized with a multiply resistant organism is being transported via a care van or ambulance, it is the responsibility of the discharging facility to assure necessary infection control measures to prevent the transmission of the multiply resistant organism to other patients or persons who will subsequently be using the care van, ambulance, or associated equipment. At a minimum, the following preparations should be communicated and implemented prior to transportation.

- a. Ensure the person being transported has washed their hands. Assist the patient/resident if they are unable to adequately wash their hands on their own.
- b. Wheelchairs should be cleaned if grossly soiled, and the armrests and wheelchair handles should be cleaned and disinfected following use for patient/resident transfer.
- c. Persons colonized or infected with a multiply resistant organism that may be transmitted through respiratory secretions (tracheostomy, pneumonia) should wear a mask or have the tracheostomy site covered while being transported, if possible.
- d. The discharging facility should notify the transportation staff of the person's continence status (bowel and urine).

2. *Guidance to ambulance and care van staff*

Ambulance and care van staff should implement the following precautions prior to, during and after transporting persons infected or colonized with drug-resistant organisms:

a. Handwashing

- Hands should be washed after having direct contact with persons known to be infected or colonized with a multiply resistant organism, and after removing gloves.
- When possible, hands should be washed at the sink under running water.
- Handwashing should occur in the sink in the patient's room or in an adjacent toilet room. When provision of handwashing facilities is not feasible, an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes can be used. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.

b. Gowns, Gloves

- Gloves should be worn when having direct contact with infected/colonized persons (assisting in the transfer to a wheelchair, assisting with ambulating to a vehicle).
- Gloves should be worn to clean and disinfect the vehicle following a fecal or urine accident by a person known to be infected/colonized with a multiply resistant organism.
- When possible, fluid resistant gowns with sleeves should be worn when having direct contact with infected/colonized persons who are incontinent of stool or urine or whose wound exudate can not be contained.
- Gloves and gowns will be discarded in the usual trash

c. Disinfection/environmental cleaning

- Use an Environmental Protection Agency (EPA) registered disinfectant on solid surfaces including floors and furniture in areas used by patients with resistant organisms.
- Wheelchairs and stretchers used by more than one person should be disinfected between use with an EPA approved disinfectant. If visible soiling is evident they must be cleaned with soap and water prior to disinfection.
- Items soiled with feces and urine from a person known to be infected or colonized with a multiply resistant organism should be cleaned with soap and water and disinfected with an approved EPA disinfectant as soon as possible after the soiling occurs, and definitely before other individuals are transported in the same vehicle.
- Any equipment used to care for persons with a multiply resistant organism should either be discarded or cleaned with soap and water and disinfected with an EPA approved disinfectant.

d. Linens

- Linens heavily soiled with urine and stool may be washed separately.
- Linens should be changed after each use.

e. Separate conveyance

- If feasible, do not transport persons infected/colonized with VRE at the same time as a person infected/colonized with MRSA. If this is the ONLY option available, physically separate these persons as much as possible while in the same vehicle.

VIII. SPECIFIC INFECTION CONTROL RECOMMENDATIONS IN A VARIETY OF HEALTH CARE DELIVERY SETTINGS FOR MRSA, VRE, AND OTHER FUTURE MULTIPLY RESISTANT ORGANISMS.

G. AMBULATORY CARE

1. Handwashing

- All **staff** who provide direct care of an individual who is known or suspected of being infected or colonized with an antibiotic resistant organism should wash their hands, preferably with an antimicrobial soap.
- Any person, **especially those with VRE**, should be reminded to wash their hands after using the toilet facilities and before mingling with others.
- Hand washing should occur in the sink in the exam or procedure room . When provision of handwashing facilities is not feasible, an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes can be used. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible

2. Gowns, gloves, masks, and eye protection

- Gown and gloves should be worn when providing care, especially if soiling with infectious material is likely.
- Gloves should be put on immediately prior to anticipated contact with infectious material or when touching surfaces soiled with infectious material.
- Remove gloves when the specific task requiring their use is completed and wash hands.
- Change gloves when performing multiple procedures on a single patient if the gloves become soiled with infectious material. If the gloves become punctured or torn, hand washing should be performed before putting on clean gloves and proceeding with the care of the patient.
- A fluid impervious disposable or reusable cover gown is the preferred barrier to infectious material.
- Gowns must be removed when the procedure requiring their use is complete and prior to leaving the exam or procedure.
- Masks and eye protection or face shields should be worn when it is anticipated that infectious material may be splashed or sprayed onto the mucous membranes of the eyes, nose, or mouth.
- The routine use of a mask for treating a patient colonized/infected with a drug resistant organism is not necessary. Staff may choose to wear a mask when in close proximity to a patient and there is a possibility that infectious body fluids or exudate may become aerosolized (i.e., a patient known to be colonized/infected with a multiply resistant organism in the nares, throat or lungs who has a chronic cough or who may discharge exudate from a tracheostomy tube).

3. Appointment scheduling

- Consider scheduling patient's appointments before a break in the day's schedule or at the end of the day in order to minimize the impact of closing the exam or procedure room or use by other patients and before the room is cleaned. (See 4 below, "Disinfection/Environmental Cleaning")

4. Disinfection/environmental cleaning

Use an Environmental Protection Agency (EPA) registered disinfectant on solid surfaces including floors and furniture in areas used by patients with multiply resistant organisms. (See Appendix B for specific concentrations and exposure times for specific concentrations and exposure times for specific disinfectants.)

- Clean heavily soiled items with soap and water before disinfection.
- Disinfect equipment which may be soiled with infectious material before removing from the room or using on another person.
- After the patient leaves the exam or procedure room, horizontal surfaces (excluding the floor) which may have been contaminated with infectious material must be cleaned and disinfected before the next patient is placed in the room. Entry to the room should be restricted until cleaning is completed.
- It is known that VRE contaminates environmental surfaces such as examination tables. It is therefore possible for hands to be recontaminated if these surfaces are touched prior to leaving the patient's area even though appropriate hand washing procedures were followed prior to interaction with the patient.

5. Linens

- Laundry contaminated with infectious material should be handled as little as possible and with minimum agitation. Laundry should be bagged or contained at the location where it was used and should not be sorted or rinsed at the location of use.
- Whenever contaminated laundry is wet and presents a reasonable likelihood of soak-through or of leakage from the bag or container, the laundry should be contained and transported in bags or containers which prevent soak-through and/or leakage of fluids to the exterior.
- The employer should assure that employees who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment.
- There are no special procedures to be used when washing items used by patients.

6. Guidelines for activities/movement of these patients

MRSA

- If patients must go to another department in the clinic, have them wash their hands before they leave the examination or procedure room.
- If patients have obvious respiratory illness, have them wear a surgical mask when outside the examination or procedure room and before they leave the clinic.
- If MRSA is in a wound, ensure that the wound is adequately covered with a clean dressing before the patient leaves the examination or procedure room.

VRE

- As much as possible, minimize the need for the patient to go to the other departments in the clinic.
- When infected/colonized patients must go to other departments in the clinic, they should wash their hands before they leave the examination or procedure room.

7. Patient care equipment

- Remove visible soil from reusable instruments with cool water and an enzymatic cleaning solution. When reusable or disposable equipment or instruments are used which are not reprocessed, they should not be shared

between patients until cleaned and disinfected..

- Discard disposable instruments or equipment in a lined waste receptacle.

8. Chart identification and signage

- Medical charts should be flagged when a patient is colonized/infected with a multiply resistant organism so appropriate infection control protocols can be used.
- Families and visitors should be instructed about how to care for the patient with multiply resistant organisms in the home setting. Appendix D may be helpful for this purpose.
- Consider including a note in the patient's demographic information in the clinic computer record system that would alert staff that the patient is infected or colonized with an multiply resistant organism. This information would facilitate appropriate scheduling and help assure that an appropriate room and adequate personal protective equipment are available at the time of the appointment.

9. Guidelines for admission, release and transfer of patients

a. *General recommendations*

- **The Americans with Disabilities Act ("ADA"), 42 U.S.C. §12182 provides that no individual shall be discriminated against on the basis of disability in the full and equal enjoyment of goods, services, facilities, privileges, advantages, accommodations of any place of public accommodation (which includes hospitals, health facilities and long term care facilities) by any person who owns, leases (or leases to), or operates a place of public accommodation.** The Rehabilitation Act of 1973, 29 U.S.C.A. §794 states that no otherwise qualified individual with handicaps shall, solely because of that handicap, be excluded from participating in, be denied the benefits of, or be subjected to any discrimination under any program or activity receiving financial assistance. In many cases, persons with infectious diseases fall within the definition of a person with a "disability" or a "handicap" and are entitled to the protection of these Acts. Thus, in the majority of cases faced by health care facilities or long term care facilities, federal law requires that these care facilities or providers must admit and care for infectious disease patients, unless the facility or provider can demonstrate that it falls within an exception to the law. These exceptions are narrowly drawn. Because the law in this area is very complex, it is recommended that care facilities or providers seek legal advice to determine their legal duties and responsibilities with regard to infectious patient admissions, releases or transfer
- All facilities must be prepared to accept and care for any patient regardless of their infection/colonization status.
- Today's health care environment must be viewed as a continuum where patients move between levels of care according to need.
- When an individual known or suspected to be infected or colonized with a multiply resistant organism is **admitted to, transferred between, discharged from, or receives treatment** in a hospital, LTCF, assisted living facility, home health agency, dialysis unit or clinic, or ambulatory care setting, the transferring facility should notify the accepting facility of the patient's infection/colonization status.

b. *Specific ambulatory care setting recommendations*

- When a patient is identified as infected or colonized with an antibiotic resistant organism, the department providing care to the patient must be notified.
- Keep documentation of known patients with multiply resistant organisms to facilitate proper actions upon return for care.
- Monitor other patients who are infected/colonized with the same drug resistant organism to uncover potential clusters/outbreaks.
- In all cases in this category, intensive patient and staff education is essential.

IX. RECOMMENDATION FOR TREATMENT OF COLONIZATION/INFECTION

1. THE COLONIZED PATIENT

A substantial fraction of antimicrobial resistance is not nosocomially acquired. Rather, persons admitted to the hospital or ICU are often colonized by very low numbers of bacteria that have the potential to develop resistance, especially when under antibiotic pressure.

1. **MRSA**

To date, all MRSA are susceptible to vancomycin, which is highly effective against MRSA infections when given intravenously. Currently, vancomycin is the drug of choice for serious MRSA infections. Many MRSA are susceptible to trimethoprim-sulfamethoxazole (Bactrim™, Septra®), which appears to be effective in treating nonbacteremic MRSA infections. Although most MRSA are susceptible to quinolones, such as ciprofloxacin, resistance to quinolones develops very rapidly. It is strongly recommended that ciprofloxacin and related drugs not be used for treatment of MRSA infections in an attempt to eradicate carriage of MRSA.

Decolonization therapy for MRSA is not routinely recommended. The need for decolonization should be based on the patient's medical condition and expected outcome. Topical or systemic antibiotics, including trimethoprim-sulfamethoxazole, rifampin, ciprofloxacin, erythromycin, doxycycline, and mupirocin, have been used with variable results to eradicate colonization by MRSA. Vancomycin is not indicated for decolonization therapy as it is ineffective for this purpose.

In some settings, treatment of individuals colonized with resistant organism may be indicated. For example, in selected circumstances of epidemic MRSA infection, colonized patients or personnel epidemiologically linked to the spread of infection could be treated with anti-staphylococcal ointments such as bacitracin or mupirocin in combination with oral antibiotics (e.g., rifampin plus trimethoprim-sulfamethoxazole), depending on strain susceptibility.

2. **VRE**

Decolonization therapy has not been clinically proven for VRE. Enterococci are part of the normal flora of the gastrointestinal tract and female genitourinary tract. Most infections with these microorganisms have been attributed to the patient's endogenous flora. Various multi-drug therapy combinations have been used to eliminate the VRE infection. Selective decontamination of the gastrointestinal tract may be considered when epidemic spread of resistant Gram-negative bacilli continues despite enforcement of routine control measures. Until the overall utility of selective decontamination in general medical-surgical ICUs has been better established, this has not been recommended as a routine practice.⁸

B. THE INFECTED PATIENT

1. MRSA

The definition of **infection** is tissue invasion by the organism **with** clinical illness. Clinical manifestations of infection caused by *S. aureus* can range from superficial skin lesions such as furuncles (boils) to deeper infections such as pneumonia which can progress to death, or disruption of normal bowel function resulting in diarrhea. In addition to local signs, systemic manifestation of disease such as fever, malaise, and leukocytosis are often present during MRSA infection. The following statements summarize key issues regarding management of MRSA-infected patients:

- a. Currently, no other antibiotics are as clinically effective as intravenous vancomycin for treatment of serious MRSA infection.
- b. Vancomycin can have serious side effects, especially in the elderly. These side effects can include ototoxicity (hearing loss or vestibular toxicity), nephrotoxicity (damage to the kidneys), and allergic reactions such as fever or rash. However, most reactions with vancomycin do not denote allergy, but rather the “red man syndrome” due to histamine release.
- c. While serious MRSA infection, such as pneumonia or bacteremia, are indication for hospital admission, many less severe MRSA infections can be effectively treated in an extended-care facility such as a nursing home.
- d. For non-bacteremic infections, if the organism is susceptible to trimethoprim-sulfamethoxazole *in vitro*, this drug is often effective and can be given orally.

2. VRE

There is no reliably effective regimen available for treatment of infection of vancomycin resistant enterococci. Other treatment regimens which have been tried include (1) quinupristin plus dalbavipristin (Synercid), (2) trovafloxacin (Trovan) plus very high doses of ampicillin and rifampin, (3) vancomycin plus penicillin G plus gentamicin, (4) chloramphenicol, (5) nitrofurantoin (for urinary tract infections only), and (6) doxycycline. For compassionate use of Synercid, contact Rhone-Poulenc-Rorer, 610/454-3071. It should be noted that Synercid activity is limited to *E. faecium* and is usually bacteriostatic and is usually associated with a high relapse rate. Two recent articles report resistance to Synercid emerging during therapy of *E. faecium* bacteremia⁴⁷ and superinfection with *E. faecalis* during Synercid treatment of *E. faecium*⁴⁸. Other agents which show *in vitro* antibiotic activity against antibiotic resistant enterococci include the glycine-glycine tetracyclines (Wyeth-Ayerst) and the oxazolidinones (Pharmacia-Upjohn).

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THE ROLE OF THE ENVIRONMENT IN THE SPREAD OF MULTIPLY RESISTANT ORGANISMS

The role of the environment in the spread of multiply resistant organisms has not yet been completely defined. Evidence suggests that while some infections are transmitted via contaminated surfaces and common use of patient care items, the majority are more likely to be transmitted horizontally by the hands of health care workers.⁴¹ Nevertheless, it is important to determine whether commonly used hospital grade disinfectants are adequate for decontamination of environmental surfaces. Recent studies comparing the effectiveness of in-use dilution of common quaternary ammonium germicidal detergents, a phenolic germicidal detergent and an iodophor detergent-germicide did not demonstrate a relationship between antibiotic and germicide resistance.⁴²

Routine disinfection and housekeeping protocols presently used in hospitals need not be altered due to concerns about the potential for environmentally mediated transmission of antibiotic-resistant organisms. However, while hospital grade disinfectant-germicides are adequate, each must be used in the proper dilution and appropriate contact time. Strict adherence to label directions provided by the manufacturer is of utmost importance. Additionally, appropriate attention must be given to the thoroughness of daily concurrent cleaning of environmental surfaces during a patient stay as well as the necessity of terminal cleaning upon discharge of the patient. In short, liberal amounts of dedicated cleaning efforts on the part of housekeeping staff along with use of an Environmental Protection Agency (EPA) rated hospital grade disinfectant-germicide product should be adequate to minimize the impact of the environment on the transmission of antibiotic resistant pathogens.

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RECOMMENDATIONS FOR DISINFECTION AND ENVIRONMENTAL CLEANING

Noncritical items are those that come into contact with intact skin but not with mucous membranes. The following **non-comprehensive** list gives examples of patient care surfaces generally regarded as non-critical and also surfaces that patients and care givers frequently touch. These require disinfection after contamination with patient body substances, especially if a resistant organism such as MRSA or VRE is present in the secretions/excretions. This list and the specifications shown below do not cover situations requiring sterilization or high-or intermediate-level disinfection; for more information on this broader range of topics, you should consult the APIC guideline for selection and use of disinfectants.⁴³

Bathroom fixtures	Electronic thermometers	Standing scales
Bed pans	Exam tables	Stethoscopes
Bed rails	Infusion/feeding pumps	Telephones
Bed scales	I.V. poles	Walkers
Commodes	Night stands	Wheel chairs
Door knobs	P.T. devices (excluding hydrotherapy tanks)	

Disinfectant	Concentration	Exposure time
Sodium hypochlorite (5.2% household bleach) prepared for use within 24 hours	1:500 dilution (100 ppm free chlorine)	No minimum exposure time
Phenolic germicidal detergent solution	Follow product label for use-dilution	Follow product label
Iodophor germicidal detergent solution	Follow product label for use-dilution	Follow product label
Quaternary ammonium germicidal detergent solution	Follow product label for use-dilution	Follow product label
Ethyl or isopropyl alcohol	70-90%	No minimum exposure time

Housekeeping surfaces such as floors, chairs, etc., should be maintained in a state of visible cleanliness by using water and an EPA approved hospital grade disinfectant/detergent designed for general housekeeping purposes.⁴⁴

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SPECIFIC LABORATORY METHODS FOR DETECTION OF MRSA AND VRE

1. *MRSA laboratory diagnosis/detection methods outline*

The identity of each suspected *S. aureus* isolate must be confirmed by Gram stain, catalase and especially coagulase (both slide and tube method) tests. After *S. aureus* has been confirmed in a culture from a colonized or infected site, antibiotic susceptibility including oxacillin susceptibility should be performed. Oxacillin susceptibility testing using the disk diffusion method is the preferred method of identifying MRSA. **Resistance to oxacillin defines resistance to all penicillins** (see discussion of antibiotic resistance in section IV). Cephalosporin susceptibility should not be reported on MRSA isolates since **all MRSA are considered to be resistant to cephalosporins** regardless of the results of *in vitro* susceptibilities.

Penicillin resistance in staphylococci is due to the presence of the enzyme β -lactamase which can be detected by routine susceptibility testing methods and evidence of enzyme activity. Methicillin resistance is due to the presence of an altered penicillin binding protein, and is expressed by a more slowly growing subpopulation of cells in any particular colony. Detection of methicillin resistance provides special challenges to the clinical laboratory. Three special methods should be used in the performance of susceptibility tests of *S. aureus* to enhance detection of methicillin resistance.

a.) Stationary Phase Growth

Stationary phase growth must be used to prepare the inoculum. This gives an advantage to the more slowly growing subpopulation. Colonies from a non-selective medium incubated overnight are used to make the appropriate inoculum suspension (stationary phase). Colonies **MUST NOT** be grown in broth until the desired turbidity is reached (log phase).

b.) Salt Supplementation

Supplementation of the susceptibility testing medium with salt enhances detection of methicillin resistance.

1. *Broth dilution*

National Committee for Clinical Laboratory Standards (NCCLS) recommends supplementation of broth with 2% NaCl. (Note that some commercial susceptibility testing products have altered the salt concentration.)

2. *Agar dilution screen*

An agar dilution screening method has been described. The agar contains 6 μ g oxacillin/ml and 4% NaCl. The agar is inoculated as a “spot” of a quadrant of the plate streaked using a cotton swab that has been dipped into a suspension equivalent to 0.5 McFarland and from which the excess fluid has been expressed.

3. *Disk diffusion*

Unsupplemented Mueller-Hinton agar is used when oxacillin resistance is being detected by the standard disk diffusion method.

Oxacillin, rather than methicillin or nafcillin, disks should be used.

c.) Incubation Time and Temperature

Incubate the susceptibility tests at 35°C for a full 24 hours, not simply “overnight.”

As with any microbiological procedure, it is critically important to assure that a pure culture of the isolate is being tested. It is also essential that the organism be accurately identified. Incorrect identification of MRSA is most commonly due to either 1) a mixed culture, most often methicillin susceptible *S. aureus* mixed with methicillin resistance coagulase-negative Staphylococcus, or 2) misidentification of coagulase-negative Staphylococcus as *S. aureus*.

The purity plate inoculated when the susceptibility test is performed must be examined very carefully for the presence of a second organism. If the Kirby-Bauer method is used, the presence of only a few colonies growing within the resistant zone around the disk should be subcultured and reidentified to assure that they are *S. aureus* (and MRSA).

Because there are coagulase-negative staphylococci that can give a false-positive slide coagulase (due to clumping factor), a tube coagulase test should always be done to confirm coagulase positivity (*i.e.*, *S. aureus*). Also note that false negative coagulase tests have been reported for MRSA when single step, commercially available, agglutination tests have been used.

2. VRE laboratory diagnosis/detection methods outline

Presumptively identify colonies on primary isolation plates as enterococci by using the colonial morphology, Gram stain, and pyrrolidonyl arylamidase (PYR) test. Although identifying enterococci to the species level can help predict certain resistance patterns (e.g., *Enterococcus faecium* is more resistant to penicillin than is *Enterococcus faecalis*) and may help determine the epidemiologic relatedness of enterococcal isolates, such identification is not routinely necessary if antimicrobial susceptibility testing is performed. However, under special circumstances or as laboratory resources permit, biochemical tests may be used to differentiate among the various enterococcal species.

Although most commercially available identification systems adequately differentiate *E. faecalis* from other species of enterococci, additional tests for motility and pigment production are required to distinguish *Enterococcus gallinarum* (motile and nonpigmented) and *Enterococcus casseliflavus* (motile and pigmented) from *E. faecium* (nonmotile and nonpigmented).

All enterococcal isolates should be tested for susceptibility to penicillin, ampicillin, and vancomycin and other drugs as clinically indicated. Results should be reported in exact units of resistance rather than simply as resistant or susceptible. Infection control staff should monitor for vancomycin resistance in cultures sent for clinical indications, *i.e.*, suspicion of infection. If a significant increase in prevalence or clustering of cases occurs, further investigation should be initiated after consultation with the medical director of the hospital.

Although different test methods can be used, it is critical that all laboratories use the same interpretive standards for determining vancomycin resistance. Since breakpoints for disk diffusion or MIC susceptibility tests are periodically changed by the National Committee for Clinical Laboratory Standards (NCCLS),⁴⁵ these documents should be reviewed on a yearly basis. The 1999 NCCLS breakpoints for determining vancomycin resistance when testing enterococci by disk diffusion are: susceptible (≥ 17 mm), intermediate (15-16 mm) and resistant (≤ 14 mm). For dilution testing, the 1999 breakpoints are susceptible ($\leq 4\mu\text{g/ml}$), intermediate (8-16 $\mu\text{g/ml}$), and resistant ($\geq 32\mu\text{g/ml}$).

Accurate detection of vancomycin resistant enterococci by the agar or broth dilution method required incubation for a full 24 hours (rather than 16-20 hours) and that the plates, tubes, or wells be examined carefully for evidence of faint growth. A vancomycin screen agar, containing 6 µg/ml of vancomycin, may also be used but will not be able to differentiate between intermediate or high level resistance. It is recommended that a MIC test be used to confirm vancomycin resistance and speciation of *Enterococcus* whenever possible.

a.) Vitek, MS/Rapid

Because manufacturers exclude use of these systems for determining vancomycin resistance, MIC data generated by VITEK or MS/Rapid panel should be verified by a second method. Agar screening plates may be used as an alternative to an MIC method to detect resistance; however, that method does not distinguish between intermediate and vancomycin-resistant strains. Newly developed software for the VITEK system, which has recently become available, should increase the reliability of this method and obviate the need to use a second method. Other new software for the Vitek system now enables speciation of *Enterococcus*.

b.) Disk Diffusion

Although this method has been shown to be unreliable for detecting resistance in strains with intermediate or low-level resistance to vancomycin, it is still an acceptable alternative for those laboratories that do not routinely conduct MIC tests. Some vancomycin-resistant strains produce hazy growth with a larger zone of inhibition. This haze is easier to detect with transmitted light than with reflected light. An extended incubation time of a full 24 hours aids in the detection of resistant strains. MIC tests should be performed for strains with intermediate zones if vancomycin is being considered for treatment.

c.) Agar Screening Plate

Agar screening plates are an acceptable method of determining vancomycin susceptibility in the absence of a reliable MIC method; however, as mentioned previously, isolates such as *E. gallinarum* and *E. casseliflavus* which have intermediate levels of resistance to vancomycin will grow on screening plates containing 6 µg/ml of vancomycin. In the absence of an MIC method, biochemical identification of isolates that grow on screening plates may be helpful in determining the correct resistance pattern of isolates. Identification of these strains may be accompanied by determination of motility and pigment production. Although *E. gallinarum* and *E. casseliflavus* have not been linked to outbreaks, both organisms carry the vanA gene and have been isolated from clinical infections following treatment with vancomycin. In addition, **these species have been found to acquire genes encoding a high level of vancomycin resistance which may be transferable to other species**. Therefore, it is recommended that isolates determined to be vancomycin-resistant by the agar screening method be confirmed by an MIC method.

d.) Microscan Standard Panel

In a Minnesota Health Department survey, the Microscan standard panel performed well with all isolates except *E. gallinarum*, intermediate susceptibility, although overall it was still better at detecting these intermediate strains than most other methods. Previous investigators have determined that these minor errors should not detract from the overall acceptability of this method.

3. *VRSA laboratory diagnosis/detection methods outline*

The 1999 NCCLS breakpoint for determining vancomycin susceptibility when testing *S. aureus* by disk diffusion is: susceptible (≥ 15 mm). All staphylococci with zone diameters of 14 mm or less should be tested by a MIC method. For dilution testing, the 1999 breakpoints are susceptible ($\leq 4\mu\text{g/ml}$), intermediate (8-16 $\mu\text{g/ml}$), and resistant ($\geq 32\mu\text{g/ml}$). Send all staphylococci determined as resistant to the Arizona Department of Health Services Laboratory at 1520 West Adams, Phoenix, Arizona, 85007-2698.

FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT VRE FOR PATIENTS AND FAMILIES

1. What is VRE?

VRE stands for Vancomycin Resistant Enterococcus. Enterococci are a type of bacteria. VRE is a type of Enterococcus that has developed resistance to the antibiotic vancomycin and to most other antibiotics. In humans, enterococci are bacteria normally found in a person's intestines and in the female genital tract. Some people may become "colonized" with VRE which means that the bacteria are present (usually in the urine or stool) but do not cause actual disease. Most people do not get sick from enterococci, even VRE.

Some people with weakened immune systems can get infections with enterococci, including VRE, in wounds, the urinary tract or the blood stream. Enterococcus bacteria causing the infection are resistant to antibiotics. Patients who get VRE infections are usually already very ill from other medical conditions.

2. How do individuals get VRE?

Enterococci are shed in a person's stool (bowel movement) or by infected sores. If hands are not washed after using the toilet, germs can be passed from one person to another. VRE can live for a long time on environmental surfaces like door knobs or toilet flush handles. Careful handwashing with soap and water, especially after using the toilet or dressing changes and before eating, is the single best preventive measure.

3. How do you treat VRE infections?

VRE infections are difficult to treat because the bacteria no longer respond to many antibiotics. At times, treatment is limited to antibiotic combinations or experimental therapy. Only disease (illness with signs and symptoms) caused by VRE should be treated. VRE colonization (when VRE is present but there are no signs or symptoms) should not be treated.

4. How will VRE impact recovery?

This depends on the condition of the individual patient and type of VRE infection involved. Treatment of illness caused by VRE is often difficult and may result in longer hospitalization. Health care workers need to take special precautions (such as use of gloves and gowns) to prevent spread of VRE to other patients. This is true for patients that are colonized with VRE and patients who are actually ill as a result of VRE infection.

5. How long will VRE last?

The length of illness caused by VRE infection depends upon the severity of the infection, the response to antibiotic therapy, and the individual's overall health. After infection has been resolved, the individual often remains colonized with VRE. Others are colonized with the bacteria and never develop infection.

Colonization can last indefinitely. Some people carry VRE in their intestinal tract for a year or more. Most patients eventually grow only normal Enterococcus when the stool is cultured. This might mean that they no longer have VRE or that they have so few VRE that the culture appears negative. The VRE may appear again if they take antibiotics.

6. How easy is it for other family members to catch this infection?

Healthy people are generally not at risk for infection with VRE. However, lack of adequate hand washing after direct care of the infected family member can result in infection or colonization of yourself or others.

7. What precautions should be followed when I go home?

Handwashing is the most important measure. Always wash hands carefully after using the toilet, using a household hand soap for at least 15 seconds. If you require continued care at home, you, or whomever is caring for you, should wear gloves when handling body fluids (urine, wound drainage, feces, etc.), when providing care, handling body fluids, or contacting surfaces contaminated with body fluids. Disposable items soiled with body fluids (dressings, diapers, used gloves, etc.) should be tied in a plastic bag (to prevent contamination of the environment) before being placed in the trash. Good cleaning with a household disinfectant such as 1:10 dilution of bleach is adequate. Laundry can be done in accordance with manufacturer's directions using standard detergent (add bleach for items heavily soiled with body fluids). Dishes and utensils can be washed as usual.

8. Are there special things that can be done to clean the house of a person with VRE?

Use a Lysol[®] type product to clean and disinfect surfaces like countertops at least twice a week. If a person with VRE shares a bathroom with others, it should be cleaned daily. Separate linens that are soiled with diarrhea or wound drainage and pretreat before washing. There is no need to wash the rest of the family's laundry separately.

9. Can a person with VRE go outside his or her home?

Yes, but the person should wash his/her hands before leaving home. In addition, they should wash their hands after each restroom use or if a dressing is changed while out.

10. Can people visit the home of someone with VRE?

Yes. Only people who have had major surgery, chemotherapy or recent antibiotic treatment are at risk of getting infected by VRE. These people may want to delay visiting. If they visit, they may want to take extra precautions to avoid infection. They may want to wear a gown and gloves while visiting. Before they leave, they should wash their hands thoroughly.

QUESTIONS AND ANSWERS FOR EMPLOYEES OF ACUTE CARE FACILITIES REGARDING VRE

1. What is VRE?

VRE stands for Vancomycin Resistant Enterococcus. VRE are strains of Enterococcus bacteria that have developed resistance to the antibiotic vancomycin and most other antibiotics. An individual can be “colonized” with VRE [*i.e.*, the bacteria are present (usually in the urine or stool) but do not cause disease] or “infected” with VRE (*i.e.*, the bacteria cause signs and symptoms of disease). The most common VRE infections are urinary tract infections, wound infections, and bacteremia.

2. How is VRE transmitted?

Because enterococci are found normally in the gastrointestinal tract and female genital tracts, most enterococcal infections have been attributed to endogenous sources from within the individual patient. However, outbreaks and endemic infections caused by enterococci, including VRE, can result from patient-to-patient transmission (most likely via hands of health care workers or contaminated patient care equipment/environmental surfaces).

3. How is VRE treated?

Only VRE infection, not colonization, is treated. VRE infections are difficult to treat because the organisms often are resistant to most antibiotics. Therapy is based on the antibiotics to which an individual isolate is susceptible. Often, however, treatment is limited to unproven combinations of antibiotics or experimental therapies.

4. How can I prevent spread of VRE?

Handwashing, using a soap and warm running water for at least 15 seconds is the **single most important measure** necessary to control the spread of VRE.

In addition, preventing and controlling the spread of VRE requires coordinated efforts from all individuals directly or indirectly involved in patient care (e.g., nursing, medical, and infection control staff; laboratory, pharmacy, and housekeeping personnel, and administration). All of the following should be addressed:

- a. Prudent vancomycin use by clinicians;
- b. Ongoing staff education regarding the problem of vancomycin resistance;
- c. Early detection and prompt reporting by the microbiology laboratory of vancomycin resistance in enterococci and other Gram-positive microorganisms;
- d. Immediate implementation of appropriate infection-control measures to prevent person-to-person transmission of VRE when identified (*i.e.*, gloves and gowns for substantial contact with the patient or the patient’s environment, use of supplies dedicated to VRE-positive patients, and thorough environmental cleaning);
- e. Clear communication regarding VRE status prior to patient transfers.

5. Do I need to wear a mask?

No, unless splashing of blood and body fluids are anticipated (*i.e.*, follow “Standard Precautions”).

6. Can I wear a patient gown as protective equipment?

No. An impervious/fluid resistant gown with sleeves should be used when a gown is needed. It does not need to be a sterile gown.

7. Do I need to do anything special when handling linen, trash, and dishes?

No. Usual facility protocols following “Standard Precautions” are adequate for these items.

8. How easy is it for me to catch this infection and take it home to a family member?

Healthy people are generally not at risk for infection with VRE. However, it is important for you to wash your hands thoroughly at the end of your work shift; lack of adequate hand washing can result in infection or colonization of yourself or others. It is also important for you to change your uniform before going home if it is heavily soiled.

9. What precautions should be taken with VRE infected/colonized patients when transporting or when they receive services from ancillary departments?

Handwashing of patients and employees caring for patients with multiply resistant organisms is key. Employees in ancillary departments should follow the same precautions (e.g., gloves and gowns for substantial physical contact with the patient). Patients should be scheduled for procedures during low volume times or at the end of the day so adequate cleaning measures of equipment or environmental surfaces can be performed.

10. Can a patient with VRE infection/colonization room with another patient?

Yes, preferably with a patient who has the same multiply resistant organism. While placement in a private room or with another patient with the same drug-resistant organism is strongly preferred, if this is not possible, then consideration can be given to placement with a roommate who does not harbor a drug-resistant organism if certain criteria are met for both patients. Such placement decisions need to be made by infection control staff.

11. Why isn't a private room “justified” for a patient with VRE?

If placing the patient in a private room would assure no transmission of VRE, a private room would be recommended. Unfortunately, the use of a private room will **not** ensure transmission will not occur. These organisms will most likely be transmitted on the unwashed or inadequately washed hands of care givers who will move on to care for additional patients regardless of whether they are in the same room or down the hall. Since VRE is not transmitted by the airborne or droplet route, a roommate who is not immunocompromised should be at no greater risk of contracting VRE if appropriate precautions are observed. Teaching the roommate good self-protection practices, such as good hand washing, is also essential. Bathroom sharing will need to be given individual consideration.

Unusual circumstances, such as the behavior of a particular infected person, would need to be evaluated on an individual basis.

12. Do we need to inform the roommate or roommate's family of a patient's VRE status?

Issues of confidentiality need to be balanced with the need to protect those at risk of acquiring infection. Without disclosing the specific medical condition of the patient with VRE, the roommate or roommate's family should be taught good handwashing technique and how to follow precautions when they have direct contact with the patient or their equipment.

13. What precautions should family or visitors take?

Persons visiting a patient with VRE colonization or infection should be encouraged to wash

their hands with soap and water upon leaving the room of an individual with a drug-resistant organism.

14. **Can we use an electric thermometer for patients with VRE?**

No. It is better to use a single glass or digital thermometer that stays in the patient's/resident's room. A dedicated stethoscope and blood pressure cuff should be used..

15. **What do we need to do to prepare for admitting a patient with VRE?**

Provide mandatory inservices to all staff regarding the transmission of VRE beforehand. Include this training in orientation as you have with MRSA. Be certain that housekeeping staff have an understanding of the importance of daily cleaning of the room. Evaluate compliance regularly and answer questions as they arise.

16. **Do we need to notify a public health agency when a person with VRE infection or colonization is admitted to or recognized within our facility?**

Yes. VRE is reportable to your local health agency (county health department or Indian Health Service (IHS)).

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QUESTIONS AND ANSWERS FOR EMPLOYEES OF LONG-TERM CARE FACILITIES REGARDING VRE

1. What is VRE?

VRE stands for Vancomycin Resistant Enterococcus.. VRE are strains of Enterococcus bacteria that have developed resistance to the antibiotic vancomycin and most other antibiotics. An individual can be “colonized” with VRE (i.e. the bacteria are present [usually in the urine or stool] but do not cause disease) or “infected” with VRE (i.e., the bacteria cause signs and symptoms of disease). The most common VRE infections are urinary tract infections, wound infections, and bacteremia.

2. How is VRE transmitted?

Because enterococci are found normally in the gastrointestinal tract and female genital tracts, most enterococcal infections have been attributed to sources from within the individual patient. However, outbreaks and endemic infections caused by enterococci, including VRE, can occur through patient-to-patient transmission (most likely via hands of health care workers or contaminated patient care equipment/environmental surfaces).

3. How is VRE treated?

Only VRE infection, not colonization, is treated. VRE infections are difficult to treat because the organisms often are resistant to most antibiotics. Therapy is based on the antibiotics to which an individual isolate is sensitive. Often, however, treatment is limited to unproven combinations of antibiotics or experimental therapies.

4. How can I prevent spread of VRE?

Handwashing, using soap and warm running water for at least 15 seconds is the **single most important measure** necessary to control the spread of VRE.

In addition, preventing and controlling the spread of VRE requires coordinated efforts from all individuals directly or indirectly involved in resident care (e.g., nursing, medical, and infection control staff; laboratory, pharmacy, and housekeeping personnel, and administration). All of the following should be addressed:

- a. Prudent vancomycin use by clinicians;
- b. Ongoing staff education regarding the problem of vancomycin resistance;
- c. Early detection and prompt reporting by the microbiology laboratory of vancomycin resistance in enterococci and other Gram-positive microorganisms;
- d. Immediate implementation of appropriate infection-control measures to prevent person-to-person transmission of VRE when identified (i.e., gloves and gowns for substantial contact with the resident or the residents’ environment, use of supplies dedicated to VRE-positive residents, and thorough environmental cleaning);
- e. Clear communication regarding VRE status prior to resident transfers.

5. Do I need to wear a mask?

No, unless splashing of blood and body fluids are anticipated (i.e., follow “Standard Precautions”).

6. Can I wear a patient gown as protective equipment?

No. An impervious/fluid resistant gown with sleeves should be utilized when a gown is needed. It does not need to be a sterile gown.

7. Do I need to do anything special when handling linen, trash, and dishes?

No. Usual facility protocols following “Standard Precautions” are adequate for these items.

8. How easy is it for me to catch this infection and take it home to a family member?

Healthy people are generally not at risk for infection with VRE. However, it is important for you to wash your hands thoroughly at the end of your work shift; lack of adequate hand washing can result in infection or colonization of yourself or others. It is also important for you to change your uniform before going home if it is heavily soiled.

9. Can the resident room with another resident?

Yes, preferably with a resident who has the same drug-resistant organism. While placement in a private room or with another resident with the same drug-resistant organism is strongly preferred, if this is not possible, then consideration can be given to placement with a roommate who does not harbor a drug-resistant organism if certain criteria are met for both patients. Such placement decisions need to be made by infection control staff.

10. Why isn’t a private room “justified” for a resident with VRE?

If placing the resident in a private room would assure no transmission of VRE, a private room would be recommended. Unfortunately, the use of a private room will **not** ensure transmission will not occur. These organisms will most likely be transmitted on the unwashed or inadequately washed hands of care givers, and those hands go to the next person regardless of whether or not the person is in the same room or down the hall. Since VRE is not transmitted by the airborne or droplet route, a roommate who is not immunocompromised should be at no greater risk of contracting VRE. Teaching the roommate good self-protection practices, such as good hand washing is also essential. Bathroom sharing will need to be given individual consideration. Unusual circumstances, such as the behavior of a particular infected resident, would need to be evaluated on an individual basis.

11. Do we need to inform the roommate or roommate’s family of a resident with VRE?

Issues of confidentiality need to be balanced with the need to protect those at risk of acquiring infection. Without disclosing the specific medical condition of the resident with VRE, the roommate or roommate’s family should be taught good handwashing technique and how to follow precautions when they have direct contact with the resident or their equipment.

12. What precautions should family or visitors take?

Visitors should be encouraged to wash their hands preferably with an antiseptic soap and water upon leaving the room of a resident with a drug-resistant organism.

13. What can we do with the nursing home resident who is colonized with VRE and is incontinent of stool?

Assure that frequent handwashing is done for the resident, provide disposable incontinent pads, be certain that staff provide frequent hygiene needs for the resident, at least every two hours.

14. Do we need to follow special precautions for residents with VRE when using shower chairs or whirlpool tubs?

Yes, you should follow the same precautions as those with MRSA. All bathing equipment and shower areas should be cleaned and disinfected after use.

15. Can residents attend activities such as Bingo if they have VRE?

Yes, as long as hand washing is provided to the resident before such activities.

16. Can we use an electric thermometer for residents with VRE?

No. It is better to use a single glass thermometer that stays in the resident's room. A dedicated stethoscope and blood pressure cuff is suggested.

17. What do we need to do to prepare for admitting a resident with VRE?

Provide mandatory inservices to all staff regarding the transmission of VRE beforehand. Include this training in orientation as you have with MRSA. Be certain that housekeeping staff understand the importance of daily cleaning of the room. Spot check compliance regularly and answer questions as they arise.

18. Do we need to notify public health of a VRE admission to our facility?

Yes. VRE is reportable to your local health agency (county health department or Indian Health Service (IHS)). You should notify the medical director and the infection control staff in your facility of any residents with VRE colonization or infection. If you have an outbreak of VRE, you need to thoroughly investigate the reason for the outbreak and take corrective measures to prevent further transmission.

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SUGGESTED ELEMENTS WHICH SHOULD BE CONTAINED IN ANY LONG-TERM CARE FACILITIES POLICY REGARDING VRE:

[Please be advised that the following summary is not in and of itself a complete policy. The elements contained below should be expanded and individualized by each facility before it is incorporated into a facility's policy and procedure manual.]

Policy: VRE (Vancomycin Resistant Enterococcus)

Definition: VRE are strains of enterococci that are resistant to multiple antibiotics, including vancomycin. Enterococci are part of the normal bacterial flora of the gastrointestinal bowel and female genital system. Residents treated with vancomycin can acquire VRE which can result in VRE infection or colonization.

Policy statement: Appropriate infection control measures will be used for residents identified to be infected or colonized with VRE to prevent the transmission of VRE to others. Residents with VRE will not be denied admission into the facility providing an appropriate room is available.

Procedure:

1. Private room is preferred, but if not available, resident can be cohorted with another resident with VRE or a resident who is NOT immunosuppressed or does not have an invasive device or open wounds.
2. Determine whether the resident will benefit from a commode at the bedside.
3. Provide dedicated equipment at the bedside including a glass thermometer, stethoscope, sphygmomanometer. If such devices are to be used on other residents, nursing will clean and disinfect them first with facility disinfectant per facility policy. Bed rails, call cords, door knobs, commode, and furniture in the room should be cleaned and disinfected daily and as needed by housekeeping following isolation guidelines.
4. Wear gloves when having direct resident contact or when touching contaminated resident equipment
5. Wear gown when significant contact with resident, linen or resident equipment is anticipated. Insignificant contact may include entering the room to deliver a food tray or for routine maintenance of the room with no direct contact with the resident.
6. Remove gloves and gowns before leaving the room and wash hands immediately for 15 seconds with an antiseptic soap. After handwashing, be sure clothing and hands do not touch environmental surfaces potentially contaminated with VRE, e.g., door knobs, curtain.
7. Clinical records of residents who are infected or colonized with VRE will be noted on the diagnosis page and a VRE sticker will be placed on the first page of discharge package if resident is transferred to any other facility. This includes visits to clinics and emergency departments.
8. Modification or removal of precautions will take place on a case by case basis with directives from the infection control staff based on risk factors for transmission and culture results.

Essential points:

1. Provide teaching to the resident, family, visitors and staff as needed to insure compliance with prevention of transmission of VRE. Any questions can be directed to infection control staff.
2. Residents may attend any activity, therapy and appointment provided that handwashing is provided for the resident before they leave their room and basic hygiene needs are met.
3. When a resident is discharged from a room, disposable items should be discarded, no equipment should leave the room until it has been thoroughly cleaned and disinfected by housekeeping per disinfection policy.
4. Place soiled linen directly into bags at the bedside and empty at the end of each shift. Gowns and gloves are needed for linen handling.

VRE FACT SHEET (Vancomycin Resistant Enterococcus)

What is VRE?

Enterococcus is a bacteria that normally lives in the human intestine. Everyone has it from shortly after their birth until their death. You cannot catch Enterococcus because you already carry it. Thus, it is very different from other diseases such as shigellosis where people only carry the organism when they have the disease and the disease is spread person-to-person.

However, Enterococcus can cause infections if it contaminates a part of the body besides the intestine, such as the bladder. These infections usually do not come from someone else, but rather, from the person themselves and the normal bacteria in their gut. To help the body fight infection, antibiotics are sometimes given. Normal Enterococcus is susceptible to the antibiotics penicillin, gentamicin, and vancomycin. Through evolution, some *Enterococcus* bacteria have become resistant to these antibiotics. An antibiotic generally cannot kill the bacteria that are resistant to it. When an *Enterococcus* bacteria is resistant to vancomycin and other antibiotics, it is called “vancomycin resistant Enterococcus” or VRE.

Why is VRE important?

Fortunately, Enterococcus does not cause a lot of serious infections, especially in healthy people. However, when it does cause infections the infections may range from **relatively minor** (i.e., urinary tract infections) to **life threatening** such as on the heart valves (endocarditis). If the infection is caused by VRE rather than normal Enterococcus, it is difficult to find combinations of antibiotics to control the infection. The patient’s own immune system must fight off the infection or the infection could progress and kill the patient. Thus, infections with VRE are potentially serious.

If someone has VRE will he or she die?

No! There is a huge difference between carrying vancomycin resistant Enterococcus (VRE) in the gut along with billions of normal Enterococcus and having an infection with VRE. The only risk of carrying VRE is that it may cause an infection sometime in the future. The infection might not be treatable. If no infection occurs, having vancomycin resistant Enterococcus in the intestine is as normal as carrying regular Enterococcus.

How does someone get VRE?

People may become carriers of VRE in two ways: (1) Patients who have been sick and have used antibiotics may have the Enterococcus in their intestine and become resistant to antibiotics; (2) Much more commonly, however, patients acquire VRE from people around them who are carrying VRE in their stool (bowel movements) and do not properly wash their hands after a bowel movement and then touch objects or prepare food. You may then become infected if you put your hands in your mouth after touching a contaminated surface or consuming contaminated food.

Risk factors for becoming colonized or infected with VRE include severe illness, immunosuppression (for example, cancer patients on chemotherapy) and taking antibiotics. Antibiotics kill off many of the normal Enterococcus in the intestine and any contamination with VRE allows the VRE to multiply while the normal Enterococcus cannot. Thus, patients taking antibiotics (especially vancomycin) for any reason may become colonized with VRE in their intestine. Most people who carry VRE are only identified when they have an infection.

What can be done to stop the spread of VRE?

Stopping the spread of VRE from one patient to another is important. If more people carry VRE, then more infections will be caused by VRE. The two cornerstones for preventing the spread of VRE are proper handwashing by health care workers between each patient (using an antibacterial soap for 15 seconds) and limiting the use of antibiotics to patients who have a clear indication for them. These steps are simple but require action by all types of health care providers including physicians, nurses, and other staff.

Should patients with VRE be isolated?

Isolation precautions to protect other patients from being colonized with VRE depends on several factors. Most hospitals need to strictly isolate patients. They do this because of their other patients tend to be quite ill and thus susceptible to VRE colonization or infection. On the other hand, patients who live in their own home generally require no isolation or limits on their activities. They will adequately protect their family and friends if they wash their hands well after toileting. The isolation precautions needed in nursing homes and other living situations varies between these two extremes.

Should patients or health care workers be screened for VRE?

Routine screening (with rectal swabs for bacterial culture) is not indicated. There is no evidence that screening reduces the spread of VRE. Proper disposal of fecal waste (stool) and proper handwashing should be the standard of care in any living situation, regardless of whether a patient carries VRE. Screening may be done in special circumstances such as when an outbreak of VRE infections occurs in a facility.

Should patients with VRE be transferred?

Being a carrier of VRE should not limit a patient's admission to any health care facility. Proper communication between facilities should include information on VRE status, if know, just as it includes current information regarding medications or drug allergies.

Do people ever rid themselves of VRE?

This is unknown. Although some patients eventually grow only normal Enterococcus when the bacteria in their stool is cultured, there may be some VRE still hiding in their intestine that will only become apparent if the patient is taking antibiotics.

FREQUENTLY ASKED QUESTIONS ANSWERS ABOUT MRSA FOR PATIENTS AND FAMILIES

1. What is MRSA?

MRSA stands for Methicillin Resistant Staphylococcus aureus. MRSA is a type of Staphylococcus bacterium that has developed resistance to the antibiotics, methicillin and other penicillins. Staphylococci bacteria are “carried” by healthy people in a variety of body sites (on the skin and in the nasal passages) without disease being present. Most people do not get sick from staphylococcal bacteria, even MRSA.

2. How do individuals get MRSA?

Individuals get MRSA the same way they get other strains of *S. aureus* which are sensitive to methicillin. The chief way individuals “get” MRSA is by contact (direct or indirect) with a person who either has a wound infection, an infection of the respiratory tract, or who is colonized with the bacteria.

MRSA can also be present on the hands of health care personnel after they care for a patient who is infected or colonized; this is the most likely means of transmitting MRSA from patient-to-patient. MRSA has also been isolated from environmental surfaces including floors, sinks, in work areas, and on equipment used by persons who are infected or colonized, but this is not the most likely means of spread.

3. Does everyone who is exposed to MRSA become infected?

No. Some individuals who are exposed to MRSA become “colonized” which means that the bacteria are present, growing and multiplying without observable signs of disease. MRSA colonization occurs on the skin surface, in the nasal passage, in the sputum or in the urine. Other individuals who are exposed to MRSA never become colonized.

MRSA colonization may precede or lead to infection in persons with weakened immune systems. However, persons who get MRSA infections are usually already very ill from other medical conditions.

4. How are MRSA infections treated?

Effective antibiotics to treat MRSA infection include vancomycin. Only patients with symptomatic MRSA infection should be treated; with few exceptions, MRSA colonization should not be treated.

5. How long will MRSA last?

The length of illness caused by MRSA infection depends upon the severity of the infection, the response to antibiotic therapy, and the individual’s overall health. After the infection has been resolved, the individual may remain intermittently or persistently colonized with MRSA and may or may not develop future infection(s).

6. What precautions should be followed when I go home?

Handwashing is the most important measure. Always wash hands carefully after using the toilet, using an antiseptic soap for at least 15 seconds. If you require continued care at home, you, or whomever is caring for you, should wear gloves when handling body fluids (urine, wound drainage, etc.), when providing care, or contacting surfaces contaminated with body fluids. Disposable items soiled with body fluids (dressings, diapers, used gloves, etc.) should be placed in the trash. Good cleaning and disinfecting with a household disinfectant such as a 1:10 dilution of

bleach is adequate. Laundry can be done in accordance with manufacturer's directions using standard detergent (add bleach for items heavily soiled with body fluids). Dishes and utensils can be washed as usual.

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QUESTIONS AND ANSWERS FOR EMPLOYEES OF ACUTE CARE FACILITIES REGARDING MRSA

1. What is MRSA?

MRSA stands for Methicillin Resistant Staphylococcus aureus. MRSA is a type of Staphylococcus bacterium that has developed resistance to the antibiotics, methicillin and other penicillins. Staphylococci bacteria are “carried” by healthy people in a variety of body sites (on the skin and in the nasal passages) without disease being present. Most people do not get sick from staphylococcal bacteria, even MRSA.

2. How is MRSA transmitted?

MRSA is transmitted in the same manner that other strains of *S. aureus* which are sensitive to methicillin are transmitted. The major mechanism is by contact (direct or indirect) with a person who either has a wound or respiratory tract infection or who is colonized with the bacteria.

MRSA can also be present on the hands of health care personnel after they care for a patient who is infected or colonized; this is the most likely means of transmitting MRSA from patient-to-patient. MRSA has also been isolated from environmental surfaces including floors, sinks, in work areas, and on equipment used by persons who are infected or colonized, but this is not the most likely means of spread.

3. How is MRSA treated?

Effective antibiotics to treat MRSA infection include vancomycin. Only patients with MRSA symptomatic infection should be treated; with few exceptions, MRSA colonization should not be treated.

4. How can I prevent spread of MRSA?

Handwashing, using soap and warm running water for at least 15 seconds is the **single most important measure** necessary to control the spread of MRSA.

In addition, preventing and controlling the spread of MRSA requires coordinated efforts from all individuals directly or indirectly involved in patient care (*e.g.*, nursing, medical, and infection control staff, laboratory, pharmacy, and housekeeping personnel, and administration). All of the following should be addressed:

- a. Prudent antibiotic use by clinicians;
- b. Ongoing staff education regarding the problem of antibiotic resistance;
- c. Early detection and prompt reporting by the microbiology laboratory of methicillin resistance in staphylococci;
- d. Immediate implementation of appropriate infection-control measures to prevent person-to-person transmission of MRSA when identified
- e. Clear communication regarding MRSA status prior to patient transfers.

5. Do I need to wear a mask?

No, unless splashing of blood and body fluids are anticipated (*i.e.*, follow “Standard Precautions”).

6. Can I wear a patient gown as protective equipment?

No. An impervious/fluid resistant gown with sleeves should be utilized when a gown is

needed. It does not need to be a sterile gown.

7. Do I need to do anything special when handling linen, trash, and dishes?

No. Usual facility protocols following “Standard Precautions” are adequate for these items.

8. How easy is it for me to catch this infection and take it home to a family member?

Healthy people are generally not at risk for infection with MRSA. However, it is important for you to wash your hands thoroughly at the end of your work shift; lack of adequate hand washing can result in infection or colonization of yourself or others. It is also important for you to change your uniform before going home if it is heavily soiled.

9. What precautions should be taken with patients when transporting and utilizing ancillary departments?

Hand washing by patients and by employees caring for patients with drug-resistant organisms is key. Employees in ancillary departments should follow the same precautions (*e.g.*, gloves and gowns for substantial physical contact with the patient).

10. Can the patient room with another patient?

Yes, preferably with a patient who has the same drug-resistant organism. While placement in a private room or with another patient with the same drug-resistant organism is strongly preferred, if this is not possible, then consideration can be given to placement with a roommate who does not harbor a drug-resistant organism if certain criteria are met for both patients. Such placement decisions need to be made by infection control staff.

11. Why isn’t a private room “justified” for a patient with MRSA?

If placing the patient in a private room would assure no transmission of MRSA, a private room would be recommended. Unfortunately, the use of a private room will **not** ensure transmission will not occur. These organisms will most likely be transmitted on the unwashed or inadequately washed hands of care givers, and those hands go to the next person regardless of whether or not the person is in the same room or down the hall. Since MRSA is not transmitted by the airborne or droplet route (unless the patient has a respiratory infection with these organisms), a roommate who is not immunocompromised should be at no greater risk of contracting MRSA.

12. Do we need to inform the roommate or roommate’s family of a patient with MRSA?

Issues of confidentiality need to be balanced with the need to protect those at risk of acquiring infection. Without disclosing the specific medical condition of the patient with MRSA, the roommate or roommate’s family should be taught good handwashing technique and how to follow precautions when they have direct contact with the patient or their equipment.

13. What precautions should family or visitors take?

Visitors should be encouraged to wash their hands with an antiseptic soap and water upon leaving the room of an individual with a drug-resistant organism.

QUESTIONS AND ANSWERS FOR EMPLOYEES OF LONG-TERM CARE FACILITIES REGARDING MRSA

1. What is MRSA?

MRSA stands for Methicillin Resistant Staphylococcus aureus. MRSA is a type of Staphylococcus bacterium that has developed resistance to the antibiotics, methicillin and other penicillins. Staphylococci bacteria are “carried” by normal people in a variety of body sites (on the skin and in the nasal passages) without disease being present. Most people do not get sick from staphylococcal bacteria, even MRSA.

2. How is MRSA transmitted?

MRSA is transmitted in the same manner that other strains of *S. aureus* which are sensitive to methicillin are transmitted. The major mechanism is by contact (direct or indirect) with a person who either has a wound or respiratory tract infection or who is colonized with the bacteria.

MRSA can also be present on the hands of health care personnel after they care for a patient who is infected or colonized; this is the most likely means of transmitting MRSA from patient-to-patient. MRSA has also been isolated from environmental surfaces including floors, sinks, in work areas, and on equipment used by persons who are infected or colonized, but this is not the most likely means of spread.

3. How is MRSA treated?

Effective antibiotics to treat MRSA infection include vancomycin. Only patients with MRSA symptomatic infection should be treated; with few exceptions, MRSA colonization should not be treated.

4. How can I prevent spread of MRSA?

Handwashing, using soap and warm running water for at least 15 seconds is in the **single most important measure** necessary to control the spread of MRSA.

In addition, preventing and controlling the spread of MRSA requires coordinated efforts from all individuals directly or indirectly involved in patient care (*e.g.*, nursing, medical, and infection control staff, laboratory, pharmacy, and housekeeping personnel, and administration). All of the following should be addressed:

- a. Prudent antibiotic use by clinicians;
- b. Ongoing staff education regarding the problem of antibiotic resistance;
- c. Early detection and prompt reporting by the microbiology laboratory of methicillin resistance in staphylococci.

5. Do I need to wear a mask?

No, unless splashing of blood and body fluids are anticipated (*i.e.*, follow “Standard Precautions”).

6. Can I wear a patient gown as protective equipment?

No. An impervious/fluid resistant gown with sleeves should be utilized when a gown is needed. It does not need to be a sterile gown.

7. Do I need to do anything special when handling

No. Usual facility protocols following “Standard Precautions” are adequate for these items.

8. How easy is it for me to catch this infection and take it home to a family member?

Healthy people are generally not at risk for infection with MRSA. However, it is important for you to wash your hands thoroughly at the end of your work shift; lack of adequate hand washing can result in infection or colonization of yourself or others. It is also important for you to change your uniform before going home if it is heavily soiled.

9. Can the resident room with another resident?

Yes, preferably with a resident who has the same drug-resistant organism. While placement in a private room or with another resident with the same drug-resistant organism is strongly preferred, if this is not possible, then consideration can be given to placement with a roommate who does not harbor a drug-resistant organism if certain criteria are met for both patients. Such placement decisions need to be made by infection control staff.

10. Why isn't a private room "justified" for a resident with MRSA?

If placing the resident in a private room would assure no transmission of MRSA, a private room would be recommended. Unfortunately, the use of a private room will **not** ensure transmission will not occur. These organisms will most likely be transmitted on the unwashed or inadequately washed hands of care givers, and those hands go to the next person regardless of whether or not the person is in the same room or down the hall. Since MRSA is not transmitted by the airborne or droplet route (unless the resident has a respiratory infection with these organisms), a roommate who is not immunocompromised should be at no greater risk of contracting MRSA. Teaching the roommate good self-protection practices, such as good handwashing, is also essential. Bathroom sharing will need to be given individual consideration. Unusual circumstances, such as the behavior of a particular infected resident, would need to be evaluated on an individual basis.

11. Do we need to inform the roommate or roommate's family of a resident with MRSA?

Issues of confidentiality need to be balanced with the need to protect those at risk of acquiring infection. Without disclosing the specific medical condition of the patient with MRSA, the roommate or roommate's family should be taught good hand washing technique and how to follow precautions when they have direct contact with the patient or their equipment.

12. What precautions should family or visitors take?

Visitors should be encouraged to wash their hands with an antiseptic soap and water upon leaving the room of a resident with a drug-resistant organism.

13. Do we need to follow special precautions for residents with MRSA when using shower chairs or whirlpool tubs?

Yes, you should follow the same precautions as those with VRE. All bathing equipment and shower areas should be cleaned and disinfected after use.

14. Can residents attend activities such as Bingo if they have MRSA?

Yes, as long as hand washing is provided to the resident before such activities.

15. Do we need to notify public health of a MRSA admission to our facility?

No.

Methicillin-resistant Staphylococcus aureus (MRSA)

What is MRSA?

MRSA stands for methicillin-resistant *Staphylococcus aureus*. It is a strain of the *S. aureus* bacterium that differs from most other bacteria by its resistance to most antibiotics including **all** penicillins and cephalosporins. MRSA can affect people in different ways. People can carry it in the nose or on the skin without showing any symptoms of illness. This is called MRSA colonization. MRSA can also cause infections such as boils, wound infections, or pneumonia, and most frequently does so in debilitated or elderly persons in health care facilities.

How is MRSA transmitted?

MRSA is spread from person-to-person by direct contact. This means that if a person has MRSA on their skin (especially on the hands) and touches another individual, they may spread MRSA. A person may have MRSA on their hands as a result of being a carrier or from touching another person who is a carrier or infected with MRSA.

What can health care workers do to prevent the spread of MRSA?

Handwashing, using an antibacterial soap and warm running water for 15 seconds, is the **single most important measure** necessary to control the spread of MRSA. Proper handwashing should be performed after the care of each patient, after handling soiled dressings and clothing and after wearing gloves. Other measures to prevent becoming infected or transmitting infection to others include avoiding cross-contamination between clean and dirty linen, daily environmental cleaning, wearing gloves for all dressing changes, proper handling of infectious waste, and observing isolation procedures. Report illness including unusual skin rashes, impetigo or boils to your nursing director before working with patients. **WASH YOUR HANDS BEFORE AND AFTER CONTACT WITH A PATIENT!**

Can health care workers take MRSA home to their families?

MRSA can survive on linens and clothing but these generally do not transmit the organism. Wear a protective garment at work if you are at risk of contaminating your clothing with wound or other body fluids or drainage. If you have contaminated your clothing with wound drainage or other potentially infectious body fluids or drainage, change your clothes before going home. Report any unusual rashes or skin lesions to your physician. Always thoroughly wash your hands before going home from work. Health personnel are not usually at risk of serious invasive MRSA disease.

How is MRSA infection treated?

The antibiotic most often used to treat persons with MRSA infections is vancomycin given intravenously. Studies also suggest that trimethoprim-sulfamethoxazole can also be used to treat minor MRSA infections.

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Handwashing

Why is handwashing important ?

Handwashing, when done correctly, is the single most effective way to prevent the spread of communicable diseases. Good handwashing technique is easy to learn and can significantly reduce the spread of infectious diseases among both children and adults.

What types of disease can good handwashing prevent?

1) Diseases spread through fecal-oral transmission. Infections which may be transmitted through this route include salmonellosis, shigellosis, hepatitis A, giardiasis, enterovirus, amebiasis, and campylobacteriosis. Because these diseases are spread through the ingestion of even the tiniest particles of fecal material, handwashing after using the toilet can not be over-emphasized.

2) Diseases spread through indirect contact with respiratory secretions. Microorganisms which may be transmitted through this route include influenza, Streptococcus, respiratory syncytial virus (RSV) and the common cold. Because these diseases may be spread indirectly by hands recently soiled by respiratory discharges of infected people, illness may be avoided by washing hands after coughing or sneezing and after shaking hand with an individual who has been coughing and sneezing.

3) Diseases may also be spread when hands are contaminated with urine, saliva or other moist body substances. Microorganisms which may be transmitted by one or more of these body substances include cytomegalovirus and Epstein-Barr virus. These germs may be transmitted from person to person or indirectly by contamination of food or inanimate objects such as toys.

What is good handwashing technique?

There is more to handwashing than you think! By rubbing your hand vigorously with soapy water, you pull dirt and oil free from your skin. The soap lather suspends both the dirt and germs trapped inside and are then quickly washed away.

Follow these four simple steps to keeping hands clean:

1. Wet your hands with warm running water.
2. Add soap, then rub your hands together, making a soapy lather. Do this away from the running water for at least 10 seconds, being careful not to wash the lather away. Wash the front and back of your hands, as well as between your fingers and under your nails.
3. Rinse your hands well under warm running water. Let the water run into the sink, not down to your elbows. Turn off the water with a paper towel and dispose in a proper receptacle.
4. Dry hands thoroughly with a clean towel.

What type of soap should be used?

Any type of soap may be used. However, bar soap should be kept in a self draining holder that is cleaned thoroughly before new bars are put out. Liquid soap containers (which must be used in day care centers) should be used until empty and cleaned before refilling. Apply lotion liberally and frequently.

What are some mistakes I should avoid regarding handwashing?

- DON'T use a single damp cloth to wash a group of children's hands.

- DON'T use a standing basin of water to rinse hands.
- DON'T use a common hand towel. Always use disposable towels in day care or food preparation settings.
- DON'T use sponges or non-disposable cleaning cloths unless you launder them on a regular basis, adding chlorine bleach to the wash water. Remember that germs thrive on moist surfaces!

What are some ways to help children with good handwashing technique?

It is important to encourage and help children to wash hands before eating, after playing outdoors or playing with pets, after using the bathroom, and after blowing their noses. Even though hands may appear to be clean, they may carry germs or microorganisms that are capable of causing disease.

Don't assume that children know how to wash their hands properly. Supervision, especially in a day care setting, is an essential element in forming good hand washing habits in children.

Finally, children learn by example! Let them observe good handwashing technique from the adults who care for them.

XII. ACKNOWLEDGMENTS

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The contents of this manual of recommendations are the result of numerous meetings and discussions among the following Antibiotic Resistant Microorganism Work Group members:

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